COASTAL MULTISPECIES PLAN

Photo Courtesy: Justin Smith, SCWA, California Coastal Chinook Salmon Adult, Russian River, CA

VOLUME II

CALIFORNIA COASTAL CHINOOK SALMON

PUBLIC DRAFT

OCTOBER 2015

DISCLAIMER

Recovery plans delineate such reasonable actions as may be necessary, based upon the best scientific and commercial data available, for the conservation and survival of listed species. Plans are published by the National Marine Fisheries Service (NMFS), sometimes prepared with the assistance of recovery teams, contractors, State agencies and others. Recovery plans do not necessarily represent the views, official positions or approval of any individuals or agencies involved in the plan formulation, other than NMFS. They represent the official position of NMFS only after they have been signed by the Assistant or Regional Administrator. Recovery plans are guidance and planning documents only; identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in any one fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C 1341, or any other law or regulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery actions.

LITERATURE CITATION SHOULD READ AS FOLLOWS:

National Marine Fisheries Service. 2015. Public Draft Coastal Multispecies Recovery Plan. National Marine Fisheries Service, West Coast Region, Santa Rosa, California.

ADDITIONAL COPIES MAY BE OBTAINED FROM:

Attn: Recovery Team
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404

Or on the web at:
http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead.html

TABLE OF CONTENTS

TABLE OF CONTENTS FOR VOLUME II POPULATIONS

INTRODUCTION TO CC CHINOOK SALMON ESU RECOVERY

The California Coastal (CC) Chinook salmon Evolutionarily Significant Unit (ESU) includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (Humboldt County, CA.) to the Russian River (Sonoma County, CA) (70 FR 37160; June 28, 2005). The ESU was historically comprised of 38 populations which included 32 fall-run populations and 6 spring-run populations across four Diversity Strata (Spence *et al.* 2008). All six of the spring-run populations were classified as functionally independent, but are considered extinct (Williams *et al.* 2011). The delineation of the CC Chinook salmon ESU Diversity Strata was based on environmental and ecological similarities and life history differences between fall-run and spring-run Chinook. Four strata were identified by Bjorkstedt *et al*. (2005): North Coastal, North Mountain Interior, North-Central Coastal and Central Coastal. Of the 32 fall-run populations, 15 populations were considered either functionally independent or potentially independent, while the remaining populations were classified as dependent populations (Spence *et al.* 2008). We have selected 17 of the 32 fall-run populations across the four Diversity Strata to represent the recovery scenario for the CC Chinook salmon ESU (Figure 1). The biological recovery criteria for these populations are (See also ESU Recovery Goals, Objectives and Criteria):

1. 13 Independent essential populations attaining low extinction risk criteria (*i.e.*, Bear River, Big River, Garcia River, Humboldt Bay tributaries, Lower Eel River (Van Duzen and Larabee), Lower Eel River (South Fork and Lower mainstem Eel), Little River, Mad River, Mattole River, Noyo River, Redwood Creek (Humboldt Co.), Russian River, and Upper Eel River);
2. Three Supporting Independent populations attaining moderate extinction risk criteria (*i.e.*, Gualala River, Navarro River and Ten Mile River);
3. One Dependent population contributing to redundancy and occupancy (*i.e.*, Albion River).

All populations in the ESU will retain ESA protections and critical habitat designation regardless of their status or role in the recovery scenario.

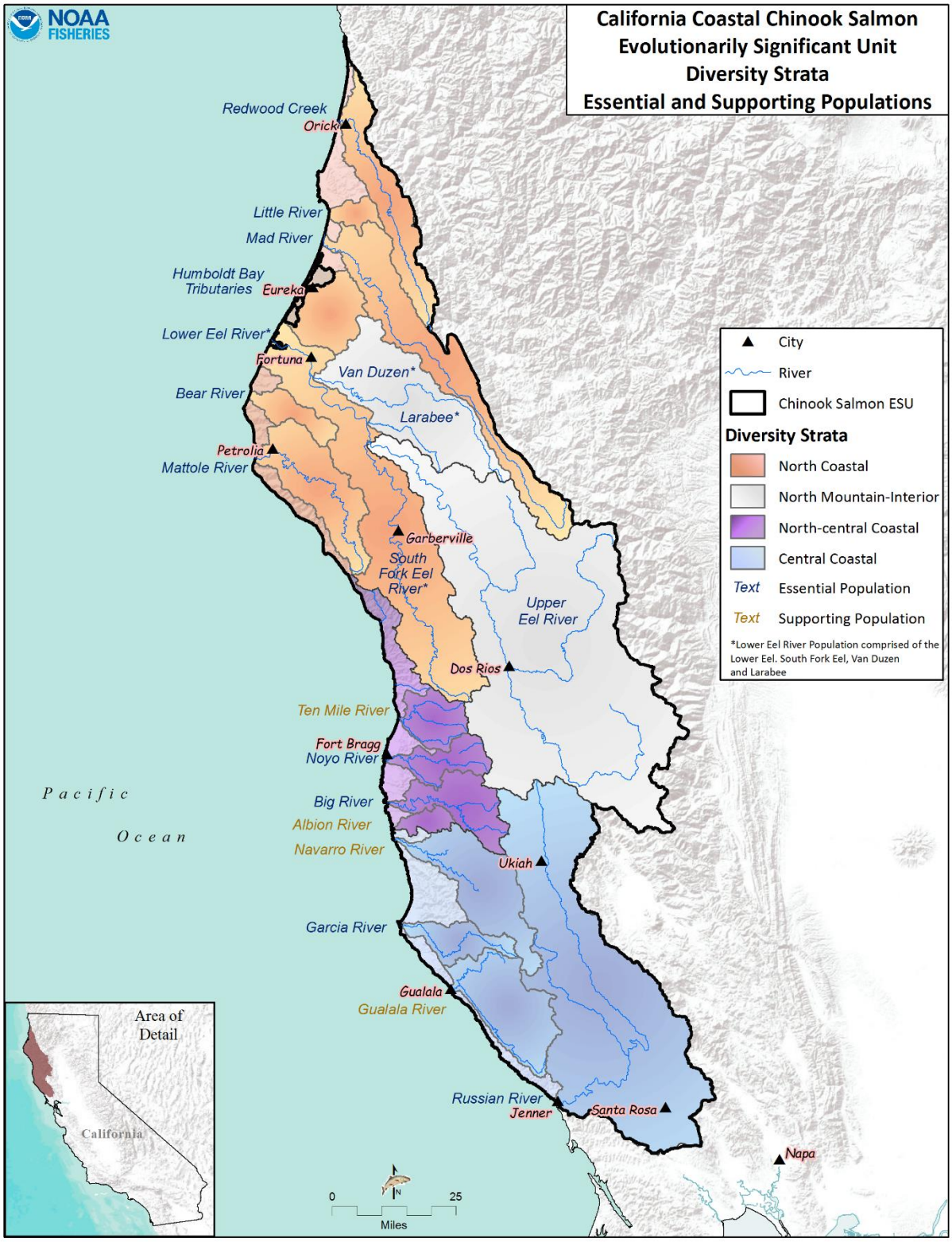

Figure 1: CC Chinook salmon ESU, Diversity Strata and Essential and Supporting Populations

CC CHINOOK SALMON ESU LISTING, STATUS REVIEWS & RECOVERY

The CC Chinook salmon ESU was originally listed as a federally threatened species in 1999 (64 FR 50394). Status reviews have been conducted in 2005 and 2010 affirming the threatened status of the species. Details in this section of Volume II include the listing decision for CC Chinook salmon, a summary of the ESA section 4(a)(1) threats identified at listing, a summary of findings from the two status reviews including the status of protective/conservation efforts, and CC Chinook salmon recovery criteria.

CC Chinook Salmon Listing

In September, 1994, NMFS initiated a status review of West Coast Chinook salmon populations in California, Oregon, Washington, and Idaho in response to a petition to list several populations of Chinook salmon in Washington under the ESA (Myers *et al.* 1998). Shortly thereafter, NMFS received a petition to list West Coast Chinook salmon throughout its entire range (63 FR 11482). NMFS' status review identified the Southern Oregon and California Coastal Chinook salmon ESU, which included all naturally spawned coastal spring- and fall-run Chinook salmon from Cape Blanco, Oregon, south to Point Bonita, California, and determined that this ESU was likely to become endangered in the foreseeable future (63 FR 11482). Following public input and a status review update, on September 16, 1999, NMFS published a final rule, in which NMFS indicated that it concluded that the Southern Oregon and California Coastal Chinook salmon ESU should be split into two smaller ESUs: (1) the Southern Oregon and Northern California Coastal Chinook salmon ESU, extending from Euchre Creek, Oregon, south through the Lower Klamath River, California (inclusive), which NMFS found to not warrant listing at that time; and (2) the CC Chinook salmon ESU, including all naturally spawned populations of Chinook salmon from Redwood Creek, California, south through the Russian River, California (inclusive), which NMFS listed as threatened under the ESA (64 FR 50394 1999; Busby *et al.* 1999). Although several CC Chinook salmon hatchery stocks were considered part of the ESU at the time of listing, hatchery stocks were not considered to be essential for the ESU's recovery and were not included in the threatened listing in 1999 (64 FR 50394). In *Alsea Valley Alliance v. Evans*, 161 F.Supp.2d 1154 (D. Or. 2001) (Alsea Valley Alliance

v. Evans 2001), the U.S. District Court in Eugene, Oregon, set aside NMFS' 1998 ESA listing of Oregon Coast coho salmon (*O. kisutch*) because it impermissibly excluded hatchery fish within the ESU listing. The court ruled that the ESA does not allow listing a subset of a Distinct Population Segment (DPS) and that, since we had found an ESU constitutes a DPS, we had improperly excluded stocks from the listing that we had determined were part of the ESU. Following the *Alsea* decision, NMFS received numerous petitions to delist, or to redefine and list, 17 salmonid ESUs (70 FR 37160). In response, NMFS reinitiated a status review of 28 ESUs of West Coast salmon and steelhead (Good *et al.* 2005). On June 28, 2005, NMFS confirmed the listing of CC Chinook salmon as threatened under the ESA and also added seven artificially propagated populations from the following hatcheries or programs to the listing: Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs (70 FR 37160). However, these hatchery programs are no longer active.

CC Chinook Salmon Section 4(a)(1) Threats

Section 4(a)(1) of the ESA and the listing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce must determine through the regulatory process if a species is endangered or threatened based upon any one, or a combination of, the following ESA section 4(a)(1) factors:

(A) the present or threatened destruction, modification, or curtailment of its habitat or range;

(B) overutilization for commercial, recreational, scientific, or educational purposes;

(C) disease or predation;

(D) the inadequacy of existing regulatory mechanisms; and

(E) other natural or manmade factors affecting its continued existence.

Through the regulatory process, the Secretary of Commerce determined the CC Chinook salmon ESU was a threatened species based on their status and threats associated with the five section 4(a)(1) factors. The specific threats associated with the section 4(a)(1) factors at, and since, listing are summarized below.

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Factor A At Listing:

Reduced habitat complexity, riparian removal, sedimentation, altered instream flows, degradation of water quality, instream wood removal and poor estuarine habitats were Factor A threats identified for CC Chinook salmon at the time of listing. At listing both natural conditions and anthropogenic activities were identified as the source of the habitat degradation. These included: agriculture, logging, ranching, recreation, mining, forestry, habitat blockages, water diversions, artificial propagation, estuarine destructions or modification, flooding, forestry, hydropower development, instream habitat problems, lack of data, general land use activities, poaching, predation, recreational angling, urbanization, and water management.

Additionally, the distribution of the Chinook salmon in this ESU was curtailed by dam construction. The spring-run life history form, which historically used upstream habitat that was heavily impacted by construction of dams, was believed extirpated. Several dams were cited as curtailing or blocking access to spawning and rearing habitat within this ESU including Warm Springs and Coyote Dams in the Russian watershed and Scott Dam on the Eel River. Peters Dam on Lagunitas Creek was also cited as a migration barrier even though the watershed was not included in the ESU.

Factor A Since Listing:

The concept of expanding the range of CC Chinook salmon was raised since listing and during the 2010 status review. Tissue samples from 17 adult Chinook salmon found in Lagunitas Creek were analyzed (Garza, unpublished data in Williams *et al.* 2011). Half of the fish were found to be closely related to Central Valley Fall Chinook and the other half related to CC Chinook. Williams *et al.* (2011) suggests these fish are most likely part of the CC Chinook salmon ESU given the ecological similarities between Lagunitas Creek and other coastal basins

and recommends Lagunitas Creek and other populations between the Russian River and the Golden Gate be placed in the CC Chinook salmon ESU. NMFS has not extended the ESU boundary to include these populations at this time. There are no recommendations at this time to include these coastal basins into the ESU due to the rare incidences of their presence in Lagunitas Creek. Nonetheless, this subject should be evaluated in future status reviews and recovery plan updates.

The restoration of salmon and steelhead habitats has been a primary focus of Federal, State and local entities. The State of California Fisheries Restoration Grant Program (FRGP) alone has invested over $250 million dollars and supported approximately 3,500 salmonid restoration projects[1]. These projects include fish passage, water conservation, improving instream habitats, watershed monitoring, education and organizational support to watershed groups. Many other entities have made investments to improve the range and habitat of steelhead. However, FRGP focuses on projects associated with Southern Oregon/Northern California Coast coho salmon, Central California Coast coho salmon, Central California Coast steelhead, Southern California steelhead and South Central steelhead. While there are benefits to CC Chinook salmon when projects overlap where CC Chinook salmon occur, specific CC Chinook salmon projects were previously not eligible for FRGP grant funding. With the public release of this recovery plan, CC Chinook salmon projects can now be applied for directly through FRGP.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Factor B At Listing:

Harvest, hatchery and research were identified at listing as mortality factors for CC Chinook salmon. Harvest was identified as a potential contributor to the decline of some CC Chinook populations. Harvest impacts to Chinook salmon in this ESU occurred primarily from incidental catch during the ocean fisheries of hatchery-produced Chinook salmon from outside

[1] http://www.dfg.ca.gov/fish/Administration/Grants/FRGP/FundSummary.asp

the ESU (*i.e.* the Klamath basin and Central Valley). Limited data on the harvest of Chinook salmon in this ESU suggested that Chinook salmon from this ESU and Klamath River (*i.e.* Klamath River fall Chinook [KRFC]) shared a similar ocean distribution concentrated between central California and central Oregon. For this reason, the KRFC age-4 ocean harvest rate is used as a proxy for the ocean harvest rate on the CC Chinook salmon ESU. Concerns were expressed at listing that using these numbers was not representative and not protective of smaller weaker coastal stocks of CC Chinook salmon. Hatchery and research mortality was acknowledged at listing but there was no indication whether these were significant threats contributing to CC Chinook salmon declines.

Factor B Since Listing:

Direct mortality in Chinook salmon fisheries

All marine fishing occurring within three nautical miles off the coast of California is managed by the California Fish and Game Commission. NMFS, in coordination with the Pacific Fishery Management Council (PFMC), manages Chinook salmon fisheries in the Federal Exclusive Economic Zone (EEZ; 3 to 200 nautical miles offshore of California). State and federal fishing regulations are coordinated and harvest of Chinook salmon is permitted subject to seasonal closures, area and gear restrictions, and bag and size limits (78 FR 25865 ; CDFW 2013).

There are still no quantitative population estimate or exploitation rate for CC Chinook salmon at this time (O'Farrell *et al.* 2015). Harvest of marked and unmarked Chinook salmon is permitted in commercial and recreational fisheries. A portion of hatchery Chinook salmon are marked (*e.g.*, Klamath River Fall-run Chinook and Central Valley Fall-run Chinook) and analyzed following capture to evaluate effectiveness of fishing regulations, however, a large portion of hatchery and wild Chinook salmon are unmarked (including CC Chinook salmon). Without analysis of tissue samples (*e.g.*, Genetic Stock Identification, otolith microchemistry, *etc.*), the origin and composition of unmarked populations are unknown. Thus, the specific level of CC Chinook salmon caught in commercial and recreational Chinook salmon fisheries remains relatively unknown (O'Farrell *et al.* 2012; O'Farrell *et al.* 2015).

Restriction of Klamath River Fall-run Chinook (KRFC) harvest is used to control Chinook salmon fisheries to a level that allows for persistence of CC Chinook at low abundances. In addition, seasonal and area restrictions are implemented to achieve a preseason-predicted KRFC age-4 ocean harvest rate of no greater than 16 percent (78 FR 25865, May 3, 2013). The area between Humboldt South Jetty and Horse Mountain has been closed to commercial salmon fishing since the early 1990s, largely for the purpose of protecting CC Chinook populations (O'Farrell *et al.* 2012). These restrictions reduce the catch of CC Chinook salmon that share common ocean ranges with KRFC (O'Farrell *et al.* 2012).

In ocean salmon fisheries, wild CC Chinook salmon are most commonly contacted from the Oregon state border to San Francisco (Weitkamp 2010; Satterthwaite *et al.* 2014). Genetic Stock Identification of Chinook salmon from the Fort Bragg area in 2010 and 2011 indicated catch per unit effort was similar for CC Chinook salmon and KRFC in the early season and higher for CC Chinook salmon than KRFC in July and August (Satterthwaite *et al.* 2014). Although CC Chinook harvest does occur in northern California, mortality levels have likely been reduced through limits to KRFC age-4 ocean harvest rates and commercial fishing area restrictions.

NMFS and CDFW met in 2014 to discuss an abundance-based fishery management (ABM) approach and to evaluate the feasibility of collecting that level of information needed for the CC-Chinook ESU (O'Farrell *et. al* 2015). It was determined that the collection of sufficient data to enable ABM will be difficult to achieve in the CC-Chinook salmon ESU (O'Farrell *et. al* 2015). The level of data needed for ABM is greater than the level of data currently collected, and is greater than the level of data that would be generated with full implementation of the California Coastal Monitoring Plan (CMP) (O'Farrell *et. al* 2015). There are substantial technical difficulties associated with spawner surveys in the ESU and new programs would need to be developed to obtain ocean harvest data (O'Farrell *et. al* 2015). Looking toward the future, important steps would include (1) addressing the technical challenges associated with implementation of the CMP and moving toward full implementation, (2) giving consideration

to a pilot study aimed at assessing the feasibility of marking and tagging programs that would provide sufficient information for estimation of ocean harvest and enable cohort reconstruction assessments, and (3) identification of stable funding for this monitoring work (O'Farrell *et. al* 2015).

Indirect mortality from catch and release of undersized Chinook salmon

Ocean harvest of any undersized Chinook salmon is not permitted in California, however, indirect mortality may occur from the catch and release of undersized CC Chinook salmon. Estimated mortality of released Chinook salmon in ocean fisheries (*e.g.,* KRFC) ranges from approximately 12 to 42 percent depending on fish size, fishery, method, and location (Grover *et al.* 2002; PFMC 2007). Undersized Chinook salmon are routinely encountered in commercial and recreational fisheries and some degree of CC Chinook salmon mortality is inevitable. It is difficult to quantify the mortality of undersized CC Chinook salmon from catch and release methods because unmarked Chinook salmon that are caught could be either CC or KRFC Chinook salmon.

In addition to causing mortality to CC Chinook salmon, fisheries can indirectly reduce diversity of life history strategies and alter the population structure, especially in small populations. There is a minimum size limit for harvest of Chinook salmon off the California coast and older Chinook salmon can be removed from the population at a disproportionately higher rate. Over time this selective pressure can lead to a predominance of Chinook salmon spawning at a younger age, which could reduce the resiliency of a population to environmental variability. This population structure and life history effect is somewhat reduced for CC Chinook salmon because the exploitation rate is presumably lower than targeted stocks such as KRFC.

Bycatch in federal non-salmon fisheries

The PFMC manages three fisheries in Federal waters potentially affecting CC Chinook salmon and CCC and NC steelhead through fishery bycatch: Groundfish, Coastal Pelagic Species (CPS), and Highly Migratory Species (HMS). The highest level of Chinook salmon bycatch occurs in

the Groundfish fishery, however, NMFS evaluated the Groundfish Fishery Management Plan (FMP) in their 1999 Biological Opinion and determined Groundfish fishery activities and implementing regulations were not likely to jeopardize the continued existence of listed salmon and steelhead (NMFS 1999).

Chinook salmon are incidentally captured in fisheries targeting CPS but at relatively low levels (PFMC 2005). Furthermore, NMFS evaluated the CPS FMP in their 2010 Biological Opinion and determined fishery activities and implementing regulations were not likely to jeopardize any endangered or threatened species under their jurisdiction. The HMS fishery targets various species of tunas, sharks, and billfishes as well as mahi-mahi. Although all listed salmonid ESUs and DPS could occur in the area where HMS fishing occurs, there are no records indicating any instance of take of listed salmonids in any HMS fisheries (NMFS 2005).

Freshwater Fishing

The 2013-2014 California state sport fishing regulations allow retention of hatchery steelhead in streams critical for CC Chinook salmon recovery. For Chinook salmon the regulations call for a catch and release fishery in the Eel River; however, mortality or reductions to spawning success associated with catch and release are relatively unknown. Many streams where fishing is allowed do not have a hatchery and the watershed has a very low likelihood of supporting hatchery-origin steelhead. Recreational fishing on the Eel River and Russian River are particularly high and anglers are likely to intercept Chinook salmon on a regular basis. Poaching and illegal retention is likely a threat in some populations. CDFW and the California Fish and Game Commission have made an effort to lessen this threat by implementing low flow fishing closures. CDFW has closed some waters to fishing in order to protect native salmon and steelhead from low water flows in California streams and rivers that have been significantly impacted by drought. CDFW has the authority under Title 14, California Code of Regulations, Section 8.00 to close select streams to fishing during specific months (depending on the area) when it determines that stream flows are below specific minimum flows or are inadequate to provide fish passage for migrating steelhead trout and salmon (depending on the area).

Although fishing is prohibited in many areas and fines for violations are high, protection of summer steelhead populations requires special enforcement efforts (Moyle *et al.* 2008). Species identification and proper handling and release techniques, when incidental capture of CC Chinook salmon occurs, is critical to reduce likelihood of mortality and ensure CC Chinook salmon adult survival. Releasing CC Chinook salmon unharmed requires specific handling, hook removal, revival efforts and minimal air exposure time (*i.e.*, time out of the water). An outreach campaign in the Russian River has been implemented and is underway to raise angler awareness with informational press releases, fliers, and species identification signs at popular angling access points (Figure 2).

Figure 2: Signage to inform recreational fishermen of differences between salmonid species found in the Russian River.

Scientific Collecting

Since the listing of this ESU the take of fish for scientific research and other purposes has been closely controlled by CDFW and NMFS through the issuance and conditioning of collection permits via a Biological Opinion (NMFS 2012) and NMFS' approval of the CDFW Research Program under 50 CFR 223.203 (promulgated by NMFS under ESA section 4(d), this regulation includes an exception to take prohibitions for a state research program approved by NMFS). Tracking of authorized take began in 2004. Beginning in 2009, project applications were submitted online at the NMFS online application website Authorizations and Permits for Protected Species (APPS). APPS has allowed for improved annual tracking of lethal and non-lethal take requested, approved, and reported for natural and listed hatchery-origin adults, smolts and juveniles. APPS data are analyzed annually to determine level of take for the ESU. Between 2004 and 2010, the actual reported percent mortality of CC Chinook juveniles and smolts for each year was at, or less than, 1 percent. The conclusion in the Biological Opinion (NMFS 2012) is that take associated with the CDFW Research Program is not likely to jeopardize the continued existence of CC Chinook salmon.

Artificial production, supplementation, and broodstock collection activities have also been terminated since the last review, and therefore, no fish are being collected for these purposes at present.

Factor C: Disease or Predation

Factor C At Listing:

Disease, freshwater predation and marine predation were threats identified for Factor C at the time of listing. Diseases associated with diminished water quantity and quality, introduced non-native fish, and hatchery programs, such as bacterial kidney disease (BKD), were considered a threat. Freshwater predation was considered a threat mostly in circumstances with introduced non-natives, low populations, and habitat conditions concentrating Chinook salmon in small areas or where avoidance habitats such as deep pools, undercut banks, or quality estuarine areas were compromised or lost. Predators such as smallmouth bass, striped

bass, channel catfish and the Sacramento pikeminnow were identified as a significant threat to Chinook salmon at the time of listing. Marine mammal predation was believed to be a minor factor for Chinook salmon decline. Nonetheless, it was acknowledged that the combination of increased predator populations and large-scale modifications to salmon habitat could favor predators and shift the predator-prey balance.

Factor C Since Listing:

Disease, freshwater predation and marine predation continue as threats for some populations. The potential of some disease outbreaks, due to introductions and straying of out-of-basin and other non-native fishes, are less likely than at the time of listing due to implementation of policies by CDFW prohibiting interbasin transfers. BKD treatment protocols at hatcheries have significantly reduced the threat of disease. Habitat conditions, such as low water flows and high temperatures, continue to exacerbate susceptibility to both disease and predation through increased physiological stress and physical injury. Salmonids appear to be a minor component of the diet of marine mammals (NMFS 1998). Predation by marine mammals coincidental with salmonid migrations may, in some cases, kill a significant fraction of a run and local depletion might occur (NMFS 1997; Quinn 2005).

Factor D: Inadequacy of Existing Regulatory Mechanisms

Factor D At Listing:

At the time of listing, a variety of state and Federal regulatory mechanisms were in place to protect CC Chinook and their habitats. However, due to funding and implementation uncertainties and the voluntary nature of many programs, those regulatory mechanisms did not provide sufficient certainty that combined Federal and non-federal efforts were successfully reducing threats to CC Chinook salmon. The following entities and their associated regulatory mechanisms were discussed under Factor D at the time of listing:

- California Department of Transportation (Caltrans)
- California Fish and Game Commission
    - Rearing programs

    - Steelhead policy
    - Water development and wetlands resources policy
- California Forest Practice Rules
- California Regional Water Quality Control Board
- California Department of Fish and Wildlife
    - Hatchery and Harvest Management
    - State Fishing Regulations
    - California Fish and Game Code Sections 1602/1603, 2786, 6900-6930
    - Keene-Nielsen Fisheries Restoration Act of 1985
    - Bosco-Keene Renewable Resources Investment Fund
    - Salmon and Steelhead Stock Management Policy
    - Steelhead Trout Catch Report-Restoration Card
    - Trout and Steelhead Conservation and Management Planning Act of 1979
    - Steelhead Restoration and Management Plan
    - Fishery Restoration Grant Program (FRGP)
    - California Coastal Salmonid Monitoring Program
- California Water Code 1243
- County Planning Efforts
- EPA/Water Quality
    - Water Quality Programs and TMDLs
    - Coastal Waters Program
    - Comprehensive Conservation and Management Plan for the San Francisco Bay-Delta Estuary
    - Wetland Protection Grants
- Five Counties MOU
- Gravel Mining Plans
- Green Diamond HCP
- NMFS
    - ESA section 7

    - Section 10 and HCPs, including Alameda Creek HCP, Green Diamond HCP, and Pacific Lumber Company (PALCO) HCPPacific Coastal Salmon Recovery Fund
    - California Coastal Salmonid Monitoring Program
- Northcoast Regional Water Quality Control Board
- Pacific Fisheries Management Council
- Pacific Coast Ocean Salmon Fishery Management Plan and Magnuson-Stevens Act
- RCDs, Watershed Organizations and Private Companies
- US Army Corp of Engineers
    - Dredge, Fill and Inwater Construction Programs
    - Section 404 of the Clean Water Act
- USDA Forest Service: Northwest Forest Plan and PACFISH

Factor D Since Listing:

Since listing, a number of factors outlined in the Federal Register listing CC Chinook salmon persist, have improved or have been identified as not relevant. The primary regulatory mechanisms that protect CC Chinook salmon are not comprehensive and are vastly different across the landscape and land use type. For example: timber operations abide by California's Forest Practice Rules while other land uses have little to no oversight or salmonid protections rely on State regulations or county ordinances when those mechanisms are triggered.

<u>Federal and State Land Management</u>

Timber harvest and associated road building was noted as a limiting factor during listing. Federally, the Northwest Forest Plan (NFP) has generally accomplished the goal of slowing aquatic degradation that had been accelerating under previous forest management programs (Reeves *et al.* 2006). Recent changes to the California Forest Practice Rules have improved riparian habitat protection on private timber lands, which make up the vast majority of timberland in the CC Chinook salmon ESU. Aside from updates to the California Forest Practice Rules, few changes to state land management programs have occurred since the last status review in 2011. Sonoma County adopted their Vineyard Erosion and Sediment Control

Ordinance (VESCO) in 2012 that aims to reduce sediment discharge into stream resulting from vineyard and orchard development. While VESCO may minimize potential erosion from these activities (both NMFS and CDFW formally questioned various ordinance underpinnings), the ordinance nevertheless fails to analyze the impact a vineyard's future water use may have on adjacent streams. Mendocino County has no ordinance or effective regulation concerning agricultural grading.

Regulating and managing marijuana cultivation, while not specifically a land management issue, is nevertheless critically important in the effort to minimize environmental damage resulting from illegal marijuana grows. The issue of marijuana regulation will likely be a contentious topic in the coming few years -- a ballot initiative legalizing recreational use of marijuana is expected on the state ballot in 2016, and a legislative effort to craft a bill legalizing recreational use may gain traction in 2015. While these political efforts may dramatically change the marijuana cultivation landscape in California, the efficacy of any regulatory scheme to minimize grow-related environmental impacts would depend on specific details unknown at this time. Having environmental advocates (*i.e.,* resource agencies or environmental NGOs) included as part of any legislative deliberations on the subject is critical toward crafting strong legalization laws that adequately and effectively minimize grow-related impacts.

Federal and State Water Management

Groundwater regulation and management should improve in the coming decades following the 2014 passage of the Groundwater Sustainability Management Act; however, surface water throughout the state is heavily over-allocated (Grantham and Viers 2014), and little change to the regulatory status quo concerning surface water rights and permitting is expected in the near future. As the state adapts to future climate variability combined with a period of accelerated population growth, the demands placed upon streams and rivers for surface water supplies will likely grow. Many large rivers and stream in the CC Chinook salmon ESU are listed by the Environmental Protection Agency and State Water Quality Control Board as impaired for

temperature and sediment pollution (per Section 303(d) of the Clean Water Act[2]). Many of the waterbodies listed will have Total Maximum Daily Loads identified, and an action plan for achieving that load, by 2019, which when implemented will improve salmonid habitat in affected streams.

Dredge, fill and instream construction programs

The U.S. Army Corps of Engineers, through their authority under the Clean Water Act, regulate dredge and fill within the ordinary high water mark of streams, rivers, wetlands, and other waterbodies. Likewise, CDFW performs a similar role for the state through their Streambed Alteration Agreement program (Fish and Game Code section 1602). Though both these programs analyze potential environmental impacts of the instream dredging, fill, and construction project in question, damage from upslope land grading remains largely under county oversight and is not properly analyzed or considered.

Factor E: Other Natural and Man-made Factors Affecting the Species' Continued Existence

Factor E At Listing:

Man-made factors of artificial propagation and introduction of non-native Chinook and the natural factors of ocean conditions, El Nino events, terrestrial conditions, floods, droughts and fire were identified at the time of listing as contributing to the threatened status of CC Chinook salmon. The threats associated with the man-made factor of propagation included competition, genetic introgression, disease transmission, non-native introductions and the taking of wild fish for broodstock purposes negatively impacting already small populations.

In conjunction with the status review for the CC Chinook salmon ESU (Good *et al*. 2005), NMFS reviewed available information on hatchery stocks and programs within the range of the ESU. This review and analysis concluded that seven artificially propagated hatchery stocks

[2] Information on the 303(d) list can be found at:
http://www.swrcb.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

(Freshwater Creek, Yager Creek/Van Duzen, Redwood Creek, Hollow Tree Creek, Van Arsdale Fish Station, Mattole River, and Mad River) were closely related to naturally spawning populations in the ESU (SSHAG 2003) based on genetic information, the source of the broodstock, and the hatchery management practices. Based on this review and evaluation, these seven hatchery stocks were ultimately included in the listed ESU in 2005 (70 FR 37160).

Marine conditions were identified as the dominant natural factor influencing Chinook salmon population abundance, distribution, migration and survival. Near-shore conditions during the spring and summer months were believed to dramatically affect year-class strength. Freshwater systems were characterized as having lost the natural processes and functions that provide resiliency to systems and the species to withstand natural variations. Furthermore, poor conditions combined with droughts and floods were thought as events causing straying and exacerbating predation, stress and disease. At listing it was hypothesized that changes in upland habitats altering flow and delivery of surface water to streams often caused earlier and higher peak flows, decreased spawning success for Chinook salmon adults and increased the mortality of emerging juveniles. Fire was identified as a threat due to the alteration of habitats.

Factor E Since Listing:

All seven artificial propagation programs that were included in the listed ESU have been terminated. The natural factors of ocean conditions, El Nino events, terrestrial conditions, floods, droughts and fire remain as threats contributing to the threatened status of CC Chinook salmon. Many populations of CC Chinook salmon have declined in abundance to levels that are well below low-risk extinction risk abundance targets, and several are, if not extirpated, likely below the high-risk depensation thresholds specified by Spence *et al.* (2008). These populations are at risk from natural stochastic processes, in addition to deterministic threats, that may make recovery of Chinook more difficult. As natural populations get smaller, stochastic processes may cause alterations in genetics, breeding structure, and population dynamics that may interfere with the success of recovery efforts and need to be considered when evaluating how populations respond to recovery actions.

Protective/Conservation Efforts for CC Chinook Salmon

Provided below is a list of the organizations and their protective efforts at, and since, listing (Table 1).

Table 1: Protective Efforts in 2015

Organization	Protective Effort Identified at Listing	Status in 2015	Notes
Association of California Water Agencies	Conducting restoration efforts	No activities specifically for CC Chinook salmon identified	Benefitting some Chinook salmon populations
Bring Back the Natives: National Fish and Wildlife Foundation	Will improve the status of native aquatic species on public land	Provides funds for conservation of fish habitat; No projects for CC Chinook salmon identified	Not a benefit
CalTrout	Unspecified	Voluntary efforts and funding in the Eel River to protect CC Chinook	Benefiting Eel River Chinook salmon populations
Eel River Watershed Group	Unspecified	Watershed coordinators who work with landowners and managers to raise community awareness, develop action plans and implement projects for salmon and steelhead	Benefiting Eel River Chinook salmon populations
Fish Friendly Farming	Provides guidance and certification to grape growers to manage lands and use practices which decrease soil erosion and sediment delivery to streams	Currently program has properties only in the Russian River	Benefiting Russian River Chinook populations
FishNet 4C	Multicounty effort to enhance and protect salmonid habitats	Defunded and no longer an active program	No longer benefiting CC Chinook salmon
Five Counties Roads Program	Program inventories and ranks all fish barriers	Continues to be beneficial in CC Chinook streams	Benefiting CC Chinook salmon
Garcia Watershed Council	Unspecified	Uncertain if council still exists	Uncertain if benefiting CC Chinook salmon
Gravel Mining Plans	Unspecified	See Factor D discussion	N/A

Humboldt Bay Watershed Advisory Council	Unspecified	Humboldt Bay Watershed Salmon and Steelhead Conservation Plan issued in 2005 improves the effectiveness of salmonid restoration and protection efforts in the Humboldt Bay watershed through implementation of the goals and objectives specified in the plan	Benefits to Humboldt Bay Chinook salmon	
Mattole Salmon Group	Unspecified	Community based non-profit organization working in the Mattole conducting monitoring, outreach and restoration.	Benefits to Mattole Chinook salmon	
Mendocino Redwood Company	Unspecified	HCP under development since 2000	No benefits to date	
National Parks Service: Redwood National Park	Directs management to restore aquatic and terrestrial ecological functions	The Park conducts restoration, monitoring, and outreach for salmon and steelhead in Redwood Creek	Beneficial to Redwood Creek Chinook Salmon	
Watershed Groups	Unspecified	Many watershed groups are conducting outreach, securing funds, implementing restoration actions and are contributing to CC Chinook salmon recovery in meaningful ways.	Benefits to CC Chinook salmon	

Protective Efforts Since Listing: While many protective efforts are in place to restore and protect CC Chinook salmon habitats, NMFS has not analyzed the certainty of their implementation and effectiveness to support a conclusion whether these efforts ameliorate the threats associated with the five section 4(a)(1) factors.

ESU RECOVERY GOALS, OBJECTIVES AND CRITERIA

Recovery goals, objectives and criteria provide a means by which the public can measure progress in the efforts at recovery and are used to link listing with status reviews and reclassification determinations. We developed eight categories of recovery criteria for the CC Chinook salmon ESU: biological viability, criteria for each of the five listing factors, degree

recovery actions have been implemented, and certainty conservation efforts are ameliorating threats.

The goal for this plan is to remove the CC Chinook salmon ESU from the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11; 50 CFR 223.102) due to their recovery. Our vision is to have restored freshwater and estuarine habitats that are supporting self-sustaining, well-distributed and naturally spawning salmonid populations that provide ecological, cultural, social and economic benefits to the people of California.

Recovery plan objectives are to:

1. Reduce the present or threatened destruction, modification, or curtailment of habitat or range;
2. Ameliorate utilization for commercial, recreational, scientific, or educational purposes;
3. Abate disease and predation;
4. Establish the adequacy of existing regulatory mechanisms for protecting CC Chinook salmon now and into the future (*i.e.,* post-delisting);
5. Address other natural or manmade factors affecting the continued existence of CC Chinook salmon; and
6. Ensure the status of CC Chinook salmon is at a low risk of extinction based on abundance, growth rate, spatial structure and diversity.

Biological Recovery Criteria

Populations selected for recovery scenarios must achieve the following criteria based on their role in recovery. Populations selected for recovery scenarios in all the diversity strata of the DPS or ESU must meet these criteria in order for the DPS or ESU to meet biological recovery criteria.

BR1 **Low Extinction Risk Criteria:** For the essential independent populations selected to be viable, the low extinction risk criteria for effective population size, population decline, catastrophic decline, hatchery influence and density-based

spawner abundances must be met according to Spence *et al*.(2008) (Table 2) (See Vol. 1 Chapter 3)

AND

BR2 **Moderate Extinction Risk Criteria:** Spawner density abundance targets have been achieved for Supporting Independent populations

AND

BR3 **Redundancy and Occupancy Criteria:** Spawner density and abundance targets for dependent populations, which are the occupancy goals for each of those populations, have been achieved (See the discussion of Spence *et al*. (2008) in Vol. I Chapter 3)

The selected populations and associated recovery criteria for the CC Chinook salmon ESU (Also see Table 3:

a. Selected populations in all four Diversity Strata achieving biological recovery criteria;

b. **BR1** 13 Independent Essential populations attaining low extinction risk criteria (*i.e.*, Bear River, Big River, Garcia River, Humboldt Bay tributaries, Lower Eel River (Van Duzen and Larabee), Lower Eel River (South Fork and Lower Eel), Little River, Mad River, Mattole River, Noyo River, Redwood Creek (Humboldt Co.), Russian River, and Upper Eel River);

c. **BR2:** Three Supporting Independent populations attaining moderate extinction risk criteria (*i.e.*, Gualala River, Navarro River and Ten Mile River);

d. **BR3**: One Supporting Dependent population contributing to redundancy and occupancy (*i.e.,* Albion River).

Table 2: Criteria for assessing the level of risk of extinction for CC Chinook salmon populations. Overall risk is determined by the highest risk score for any category. N_a is total abundance of adult spawners in a year. N_e is effective population size per generation. N_g is total number of spawners for the generation.

Population Characteristic	Extinction Risk		
	High	**Moderate**	**Low**
Extinction risk from population viability analysis (PVA)	≥ 20% within 20 yrs	≥ 5% within 100 yrs but < 20% within 20 yrs	< 5% within 100 yrs
	- or any ONE of the following -	- or any ONE of the following -	- or ALL of the following -
Effective population size per generation *-or-* Total population size per generation	$N_e \leq 50$ *-or-* $N_g \leq 250$	$50 < N_e < 500$ *-or-* $250 < N_g < 2500$	$N_e \geq 500$ *-or-* $N_g \geq 2500$
Population decline	Precipitous decline[a]	Chronic decline or depression[b]	No decline apparent or probable
Catastrophic decline	Order of magnitude decline within one generation	Smaller but significant decline[c]	Not apparent
Spawner density	$N_a/IPkm$[d] ≤ 1	$1 < N_a/IPkm <$ MRD[e]	$N_a/IPkm \geq$ MRD[e]
Hatchery influence[f]	Evidence of adverse genetic, demographic, or ecological effects of hatcheries on wild population		No evidence of adverse genetic, demographic, or ecological effects of hatchery fish on wild population

[a] Population has declined within the last two generations or is projected to decline within the next two generations (if current trends continue) to annual run size $N_a \leq 500$ spawners (historically small but stable populations not included) *or* $N_a > 500$ but declining at a rate of ≥10% per year over the last two-to-four generations.

[b] Annual run size N_a has declined to ≤ 500 spawners, but is now stable *or* run size $N_a > 500$ but continued downward trend is evident.

[c] Annual run size decline in one generation < 90% but biologically significant (e.g., loss of year class).

[d] *IPkm* = the estimated aggregate intrinsic habitat potential for a population inhabiting a particular watershed (i.e., total accessible km weighted by reach-level estimates of intrinsic potential; see Bjorkstedt et al. [2005] for greater elaboration).

[e] MRD = minimum required spawner density and is dependent on species and the amount of potential habitat available. Figure 5 summarizes the relationship between spawner density and risk for each species.

[f] Risk from hatchery interactions depends on multiple factors related to the level of hatchery influence, the origin of hatchery fish, and the specific hatchery practices employed.

Table 3: CC Chinook Salmon ESU Diversity Strata, Populations, Historical Status, Population's Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting. The Diversity Stratum recovery targets are only comprised of the essential populations because these are the populations that are expected to be viable. *The Lower Eel River Chinook population is divided between two diversity strata, and as a result has one recovery target for the North Mountain Interior DS (Van Duzen and Larabee) and one for the North Coastal DS (Lower and South Fork Eel River).

Diversity Strata	CC Chinook salmon Populations	Historical Population Status	Population's Role In Recovery	Current Weighted IP-km	Spawner Density	Spawner Abundance
North Coastal	Bear River	I	Essential	39.4	37.8	1,500
	Humboldt Bay Tributaries	I	Essential	76.0	33.7	2,600
	Little River (Humboldt County)	I	Essential	17.4	40.0	700
	Lower Eel River ~ *Lower Mainstem/ South Fork Eel River**	I	Essential	364.8	20	7,400
	Mad River	I	Essential	94.0	31.8	3,000
	Mattole River	I	Essential	177.5	22.5	4,000
	Redwood Creek (Humboldt Co)	I	Essential	116.1	29.3	3,400
	North Coastal Diversity Stratum Recovery Target					22,600
North Mountain Interior	Lower Eel River ~ *Larabee Creek/ Van Duzen River**	I	Essential	143.7	20.0	2,900
	Upper Eel River	I	Essential	521.4	20.0	10,400
	North Mountain Interior Diversity Stratum Recovery Target					13,300
North-Central Coastal	Albion River	D	Supporting	17.6	6-12	104-209
	Big River	I	Essential	104.3	30.6	3,200
	Noyo River	I	Essential	62.2	35.3	2,200
	Ten Mile River	I	Supporting	67.2	6-12	401-804

North-Central Coastal Diversity Stratum Recovery Target						5400
Central Coastal	Garcia River	I	Essential	56.2	36.0	2,000
	Gualala River	I	Supporting	175.6	6-12	1,052-2,105
	Navarro River	I	Supporting	131.5	6-12	787-1,576
	Russian River	I	Essential	466.1	20.0	9,300
Central Coastal Diversity Stratum Recovery Target						11,300

ESA § 4(a)(1) Factors Recovery Criteria

The following are the recovery criteria for the section ESA 4(a)(1) listing factors. The primary metrics for assessing whether each of the listing factor criteria have been achieved will be to utilize the CAP analyses to reassess habitat attribute and threat conditions in the future, and track the implementation of identified recovery actions unless otherwise found unnecessary.

All recovery actions were assigned to a specific section 4(a)(1) listing factor in order to track progress of implementation of actions for each factor. Recovery Action Priorities are assigned to each action step in the implementation table in accordance with NMFS' Interim Recovery Planning Guidance (NMFS 2010) and the NMFS Endangered and Threatened Species Listing and Recovery Priority Guidelines (55 FR 24296) (See Chapter 4 for more information).

Factor A: Present or threatened destruction, modification or curtailment of habitat or range

A1 CAP/Rapid Assessment attribute ratings for:

a. **Essential Populations** found Good or better for all attributes in each Stratum.
b. **Supporting Populations** found Good or better for 50 percent[3] and the remaining rated Fair throughout the DPS/ESU.

[3] The role of supporting populations within the recovery scenario is to provide for redundancy and occupancy across Diversity Stratum. Because of their role, we use lower criteria for Factor A (*i.e.*, 50 percent as Good or better and the remaining as Fair). A "Fair" CAP/rapid assessment rating means that habitat conditions, while impaired to some degree, are functioning. Therefore, at least all habitat conditions are expected to function within these populations, and at least half are expected to be in

A2 All recovery actions have been implemented under Listing Factor A, or the actions are deemed no longer necessary for recovery.

Listing Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

B1 CAP/Rapid Assessment threat ratings for Fishing and Collecting:

a. Essential and Supporting Populations found Medium or Low.

B2 All recovery actions have been implemented under Listing Factor B, or the actions are deemed no longer necessary for recovery.

Listing Factor C: Disease, Predation and Competition

C1 CAP/Rapid Assessment threat ratings for Disease, Predation and Competition:

a. Essential and Supporting Populations found Medium or Low.

C2 All recovery actions have been implemented under Listing Factor C, or the actions are deemed no longer necessary for recovery.

Listing Factor D: The Inadequacy of Existing Regulatory Mechanisms

D1 CAP/Rapid Assessment threat ratings related to Listing Factor D (see list below):

a. Essential and Supporting Populations found Medium or Low.

Listing Factor D Threats

- Agriculture
- Channel Modification
- Fire, Fuel Management and Fire Suppression
- Livestock Farming and Ranching
- Logging and Wood Harvesting
- Mining
- Residential and Commercial Development
- Roads and Railroads

---

proper condition (*i.e.*, Good), which NMFS expects will be sufficient for these populations to fulfill their role within the recovery scenario.

- Water Diversions and Impoundments

D2 All recovery actions have been implemented under Listing Factor D, or the actions are deemed no longer necessary for recovery.

Listing Factor E: Other Natural and Manmade Factors Affecting the Species' Continued Decline

E1 CAP/Rapid Assessment threat ratings for Hatcheries and Aquaculture, Recreational Areas and Activities, and Severe Weather Patterns:

a. Essential and Supporting Populations found Medium or Low.

E2 All recovery actions have been implemented under Listing Factor E, or the actions are deemed no longer necessary for recovery.

Conservation Efforts

CE1 Formalized conservation efforts applicable to the ESU or DPS have been implemented and are effective in ameliorating any remaining threats associated with the five section 4(a)(1) factors.

ESU AND DIVERSITY STRATA RESULTS

All CAP viability and threat tables were assembled for the CC Chinook salmon ESU to evaluate patterns in the ESU across Diversity Strata and populations. Attribute and threat results are discussed first for Diversity Strata followed by results across lifestages for the ESU. A subset of CAP indicators and threat results were evaluated under a climate change scenario which is provided in Appendix B.

DIVERSITY STRATA ATTRIBUTE AND THREAT RESULTS

The delineation of the CC Chinook salmon ESU Diversity Strata was based on environmental and ecological similarities and life history differences between fall fun and spring run adult populations. Four strata were identified by Bjorkstedt *et al*. (2005): North Coastal, North Mountain Interior, North-Central Coastal and Central Coastal.

Attribute Results

Across strata, the North Mountain Interior stratum had the highest percentage of viability attribute ratings reported as Poor or Fair (73%), followed by the Central Coastal (65%), North-Central Coastal (62%) and North Coastal (62%). Although the North Coastal Stratum shared the lowest combined ratings reported as Poor or Fair, it received the highest percentage of Poor ratings (33%) overall (Figure 3).

Threat Results

The North Coastal and Central Coastal Diversity Stratum had the highest combined threat ratings of Very High and High (30%) followed by the North Mountain Interior (18%) (Figure 4). All threats in the North-Central Coastal strata were rated as either Medium or Low, with an additional 27% that were deemed not applicable.

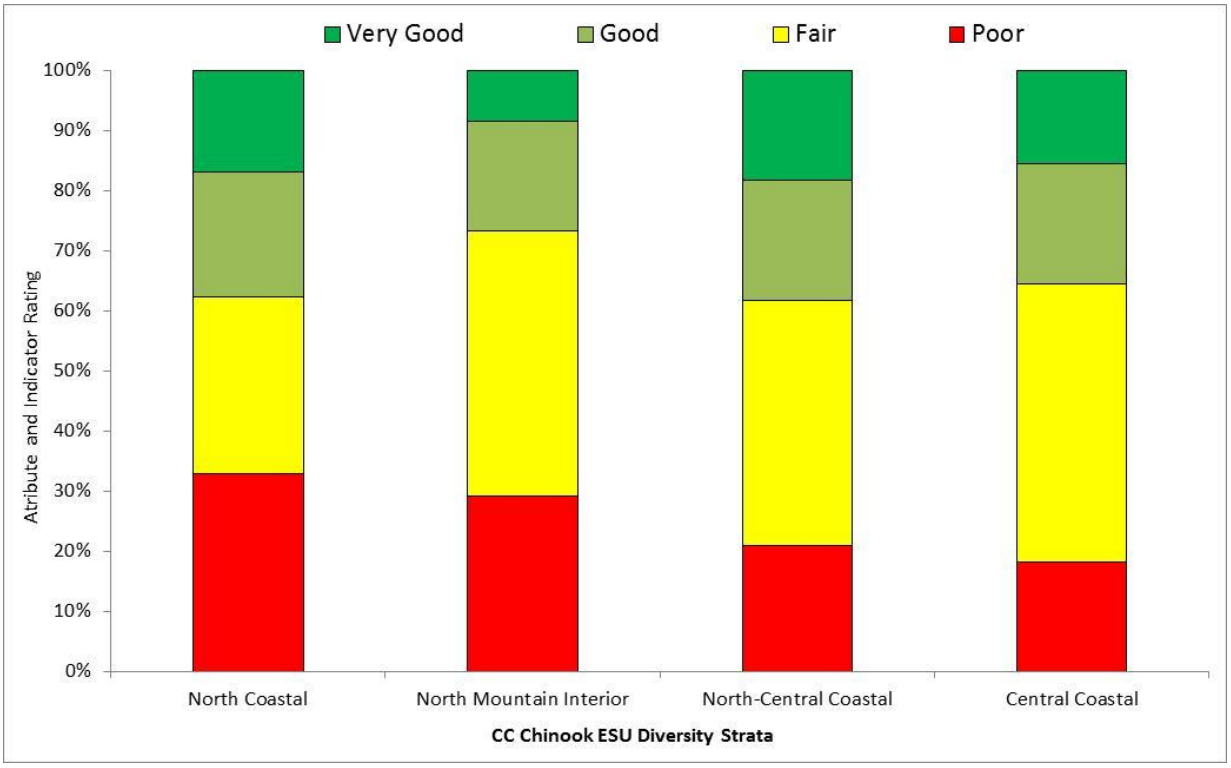

Figure 3: Attribute Indicator ratings for the CC Chinook salmon ESU by Diversity Strata.

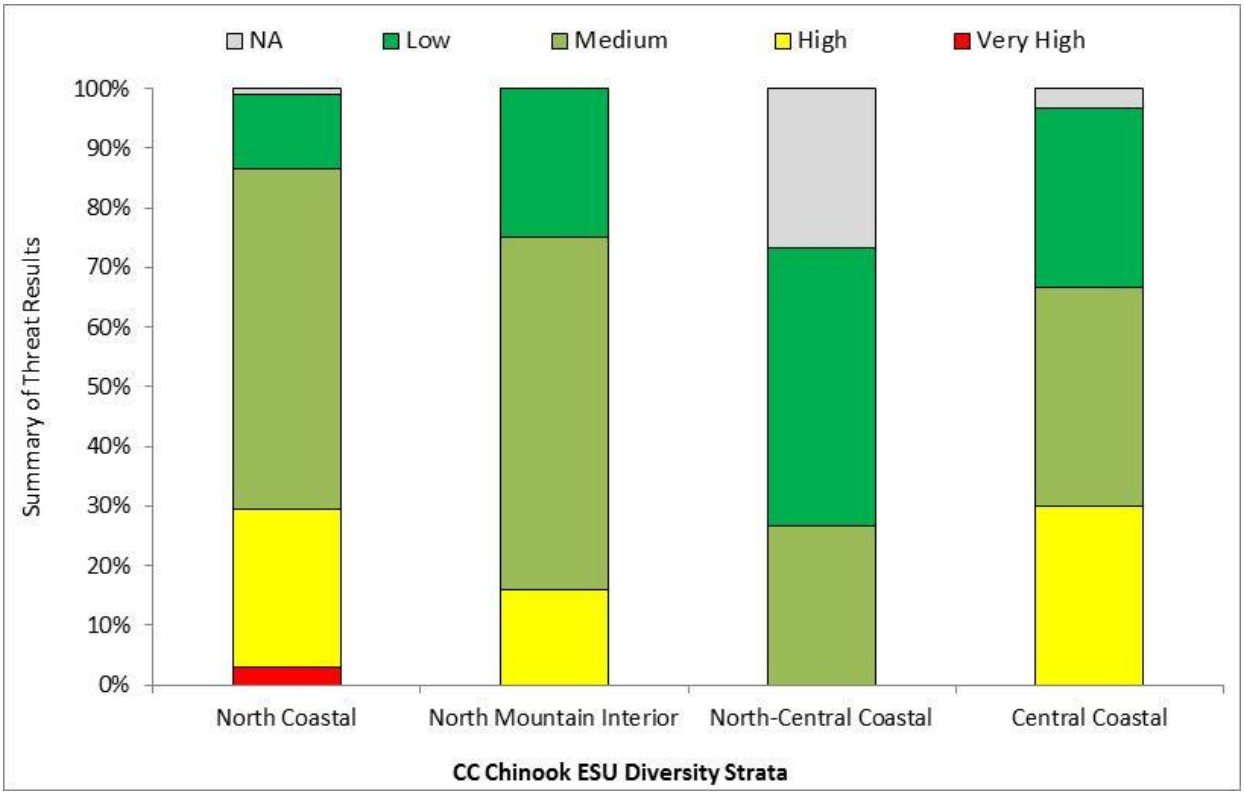

Figure 4: CC Chinook salmon Diversity Strata Threat ratings.

North Coastal Diversity Stratum Results

The North Coastal Diversity Stratum CAP populations include: Redwood Creek (Humboldt County), Little River (Humboldt County), Mad River, Humboldt Bay, South Fork Eel River, Bear River, and the Mattole River. These populations are influenced by coastal climate conditions of northern California.

Attribute Results

Across the stratum, attribute indicators of greatest concern were habitat complexity (LWD, percent staging pools, pool/riffle/flatwater ratio, and shelter), sediment transport (road density and stream side road density), estuary/lagoon (quality and extent) and water quality (turbidity) (Table 4). Attribute indicators of low concern included landscape patterns (agriculture, urbanization), passage/migration (passage at mouth or confluence, physical barriers), and to a lesser extent water quality (toxicity).

Life Stage Results

All lifestages are impaired in the North Coastal Diversity Stratum with approximately 40% or more of attribute ratings reported as Poor or Fair for each lifestage (Figure 5). The adult lifestage is the most impaired followed closely by pre smolt with 71% and 65% indicators rated as Poor or Fair, respectively. Watershed Processes are also impaired with nearly 50% of indicators reported as Poor or Fair, of which 35% were rated Poor. Attribute indicators of greatest concern for the adult lifestage included habitat complexity (large woody debris, percent staging pools, pool/riffle/flatwater ratio), riparian vegetation (tree diameter), and water quality (turbidity) (Table 5). Eggs were most impacted by sediment (gravel quantity and quality). Estuary/lagoon, habitat complexity (shelter), velocity refuge (floodplain connectivity), and water quality (turbidity) were the indicators of most concern for the pre smolt and smolt lifestages. Streamside road density was rated Poor for all populations in the stratum and road density was rated Poor for all but one population in the stratum (Mattole River).

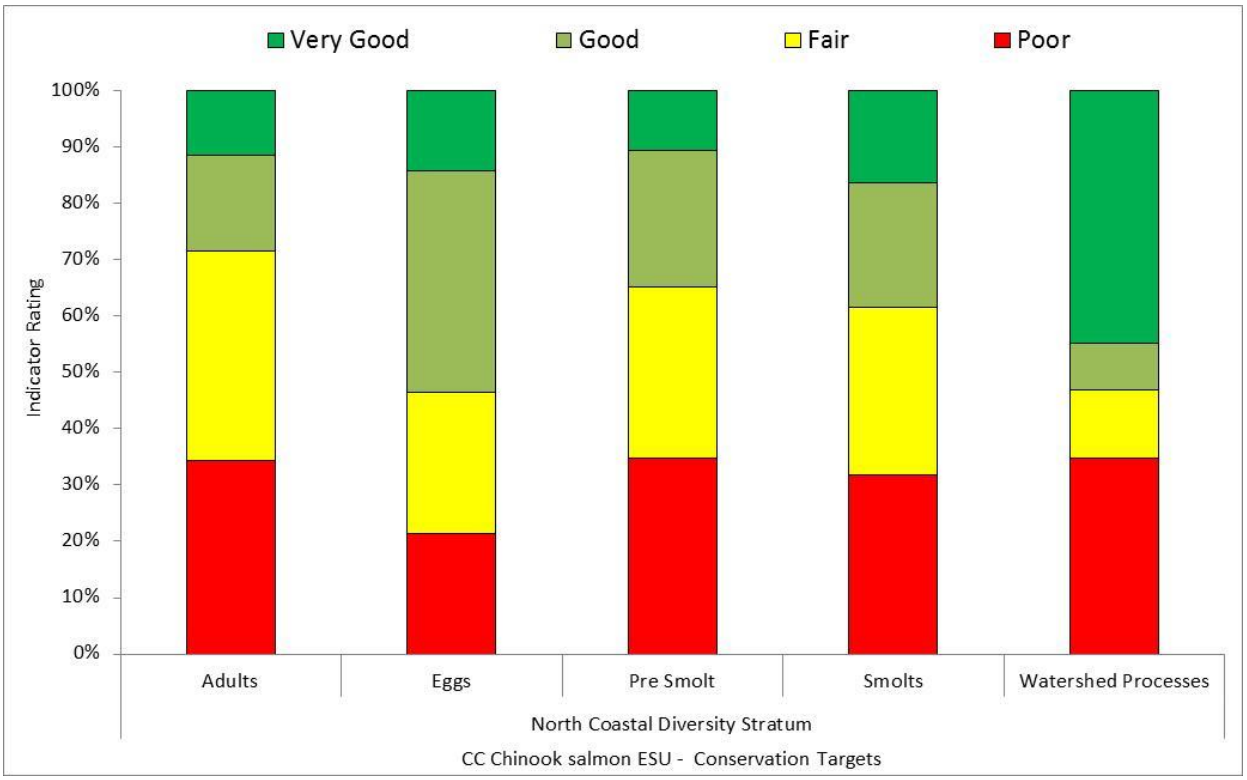

Figure 5: Attribute Indicator Ratings for the North Coastal Diversity Stratum Conservation Targets.

Threat Results

Threats of greatest concern for the North Coastal Diversity Stratum were channel modification, logging and wood harvesting, roads and railroads, and severe weather patterns (Figure 6). Threats of minimal concern included fishing and collecting, hatcheries and aquaculture, recreational areas and activities, and residential and commercial development. Across threats 13% were rated as Low, 58% were rated as Medium, 27% were rated as High and 3% were rated as Very High (Figure 6).

Figure 6: Threat ratings for the North Coastal Diversity Stratum.

North Mountain Interior Diversity Stratum Results

The North Mountain Interior Diversity Stratum CAP populations are the Van Duzen River, Larabee Creek, and Upper Mainstem Eel River populations. These populations are influenced by likely snowmelt events in the Eel River Watershed.

Attribute Results

Of the four Diversity Strata, the North Mountain Interior had the highest percentage (73%) of Poor or Fair indicator ratings (Figure 3). Although the Eel River estuary is not located within the stratum boundaries, all Chinook salmon populations within the Eel River watershed will rely upon the estuary during portions of their life cycle. Estuary/lagoon was rated Poor for all life stages and populations in the North Mountain Interior Diversity Stratum. Across the stratum, other attribute indicators of great concern included habitat complexity (large woody debris, percent primary pools, percent staging pools, pool/riffle/flatwater ratio, shelter), riparian vegetation (tree diameter), sediment (gravel quality), and sediment transport (road density, streamside road density) (Table 4). Attribute indicators of low concern were hydrology (impervious surfaces), landscape patterns (agriculture, urbanization), passage/migration (physical barriers), and riparian vegetation (species composition).

Life Stage Results

All lifestages in the North Mountain Interior Diversity Stratum are impaired with more than 72% of indicator ratings for each lifestage reported as Poor or Fair (Figure 7). Pre smolt was the most impaired lifestage with 81% of indicator ratings reported as Poor or Fair. For adults, attributes of greatest concern were estuary/lagoon, habitat complexity, riparian vegetation (tree diameter), and water quality (turbidity) (Table 5). Gravel quality and, to a lesser degree, quantity were the indicators of most concern for the egg lifestage. Attribute indicators impacting the pre smolt lifestage were estuary/lagoon, habitat complexity (percent primary pools, shelter rating), flow conditions (baseflow), riparian vegetation (tree diameter), sediment (gravel embeddedness), and turbidity. Many of the same indicators identified as a concern for

pre smolts were also identified for the smolt lifestage (Table 5). Smolts were also rated Poor for smoltification water temperatures. Like the North Coastal stratum, road density and streamside road density are the primary contributors to the degraded conditions in these populations. Timber harvest was also rated Poor in two of the three populations within the stratum.

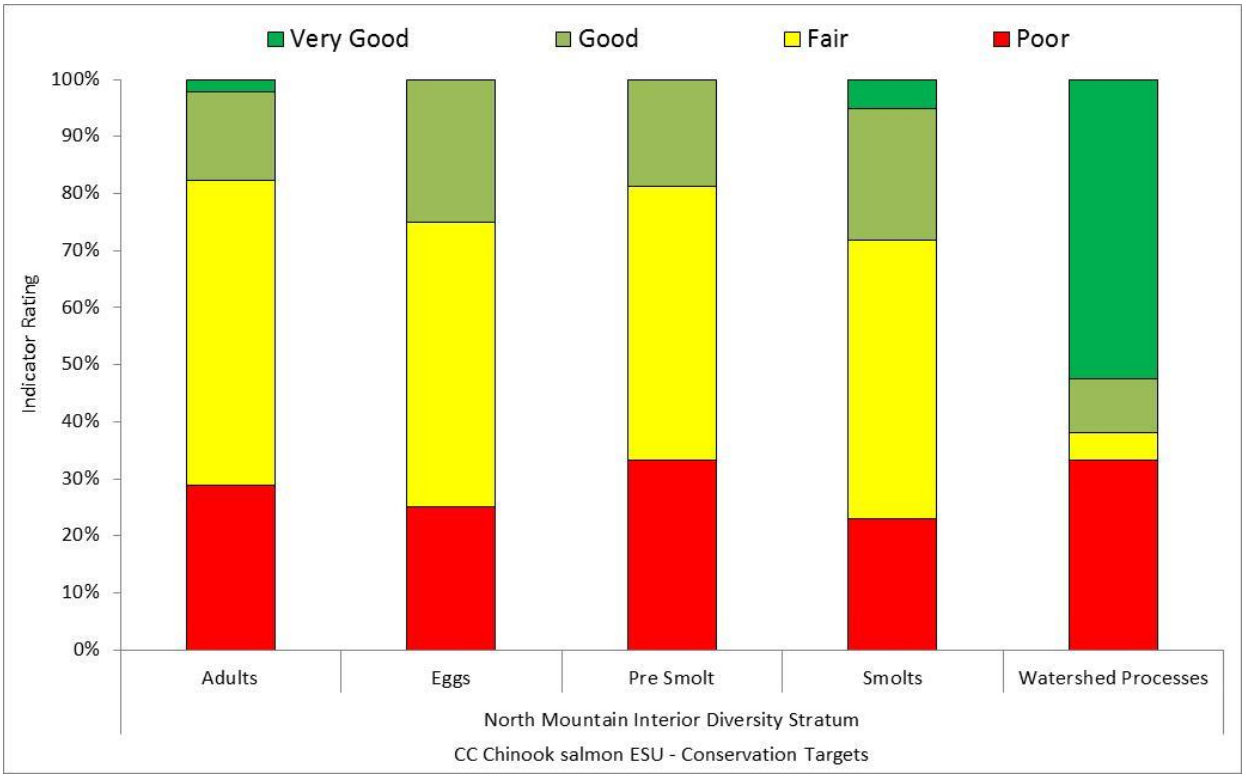

Figure 7: Attribute Indicator Ratings for the North Mountain Interior Diversity Stratum Conservation Targets.

Threat Results

Despite Poor viability ratings throughout the stratum, most threat ratings (82%) were either Low or Medium and there were no Very High ratings (Figure 8). Disease, predation, and competition (*e.g.*, introduced Sacramento pikeminnow in the Eel River) was the most significant threat followed by roads and railroads, water diversions and impoundments, and channel modification. Across all threats, 24% were rated as Low, 58% were rated as Medium, 18% were rated as High and 0% were rated as Very High (Figure 8).

Figure 8: Threat ratings for the North Mountain Interior Diversity Stratum.

North-Central Coastal Diversity Stratum Results

The North-Central Coastal Diversity Stratum CAP populations include the Noyo River and Big River. This stratum is comprised almost entirely of a forested landscape, and timber harvest is the dominant land use. Coastal and rural developments are also present.

Attribute Results

In these two populations, attribute indicators of most concern were those related to reduced habitat complexity (large woody debris, primary and percent staging pools, pool/riffle/flatwater ratio, shelter) and species viability (abundance, density, spatial structure) (Table 4). Overall, indicators for hydrology and landscape patterns were generally rated as Good or Very Good for both populations indicating that in general, habitat conditions should favor the persistence of Chinook salmon populations. This, however, conflicts with the current depressed population status and Poor viability ratings.

Life Stage Results

All lifestages in the stratum are impaired. Smolts received the most Poor or Fair ratings (76%) followed closely by eggs (75%) and adults (70%). However, adults had the highest percentage of Poor ratings alone (33%), which was nearly twice as much as any other lifestage (pre smolts, 19%) (Figure 9). Adults are most impaired by poor habitat complexity and low viability. As in all strata, eggs are most limited by impaired gravel quality and quantity while reduced habitat complexity (*e.g.*, shelter) and viability (abundance) are the indicators of most concern for the pre smolt and smolt lifestages (Table 5). Streamside road density was rated Poor in both populations.

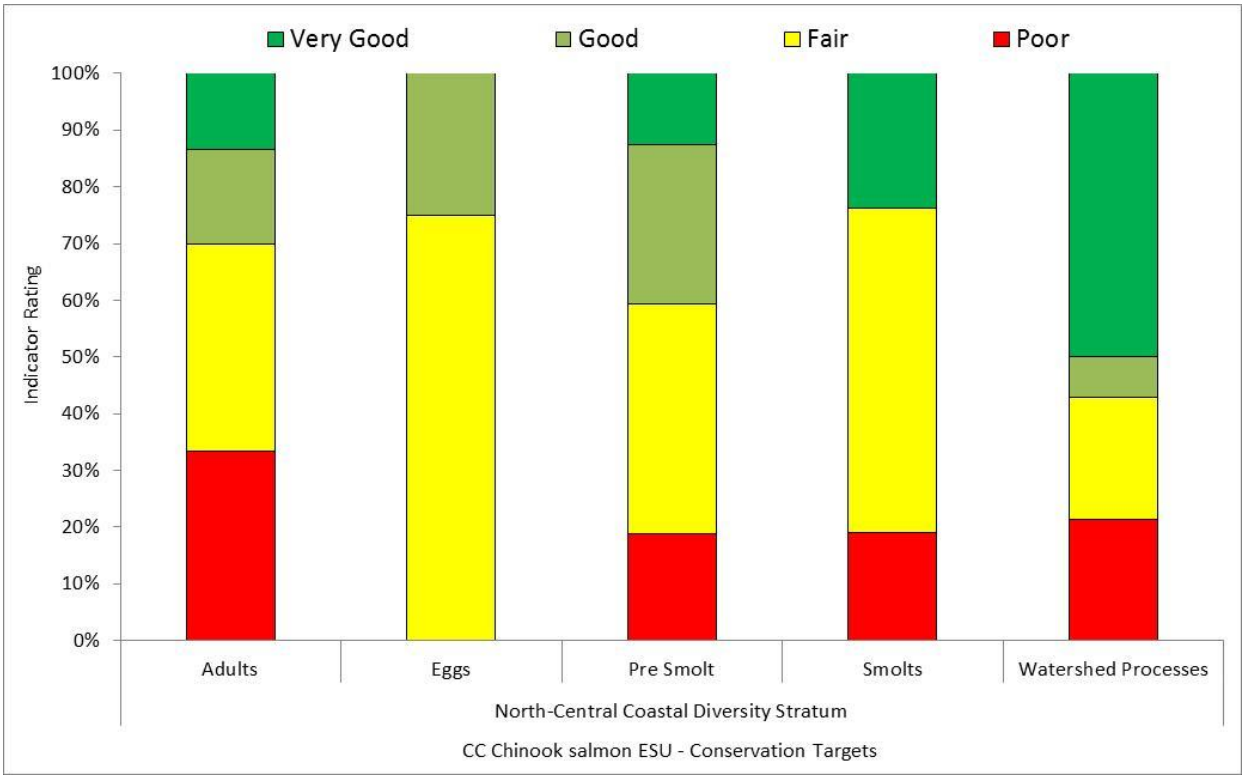

Figure 9: Attribute Indicator Ratings for the North-Central Coastal Diversity Stratum conservation targets.

Threat Results

The North-Central Coastal was the only stratum without High or Very High threats identified, though roads, severe weather, and logging were identified as medium threats in both populations (Table 6 and Figure 10). Many threats were deemed not applicable for the stratum. Across threats, 27% were rated as not applicable, 47% were rated as Low, 27% were rated as Medium, and 0% were rated as High or Very High (Figure 10).

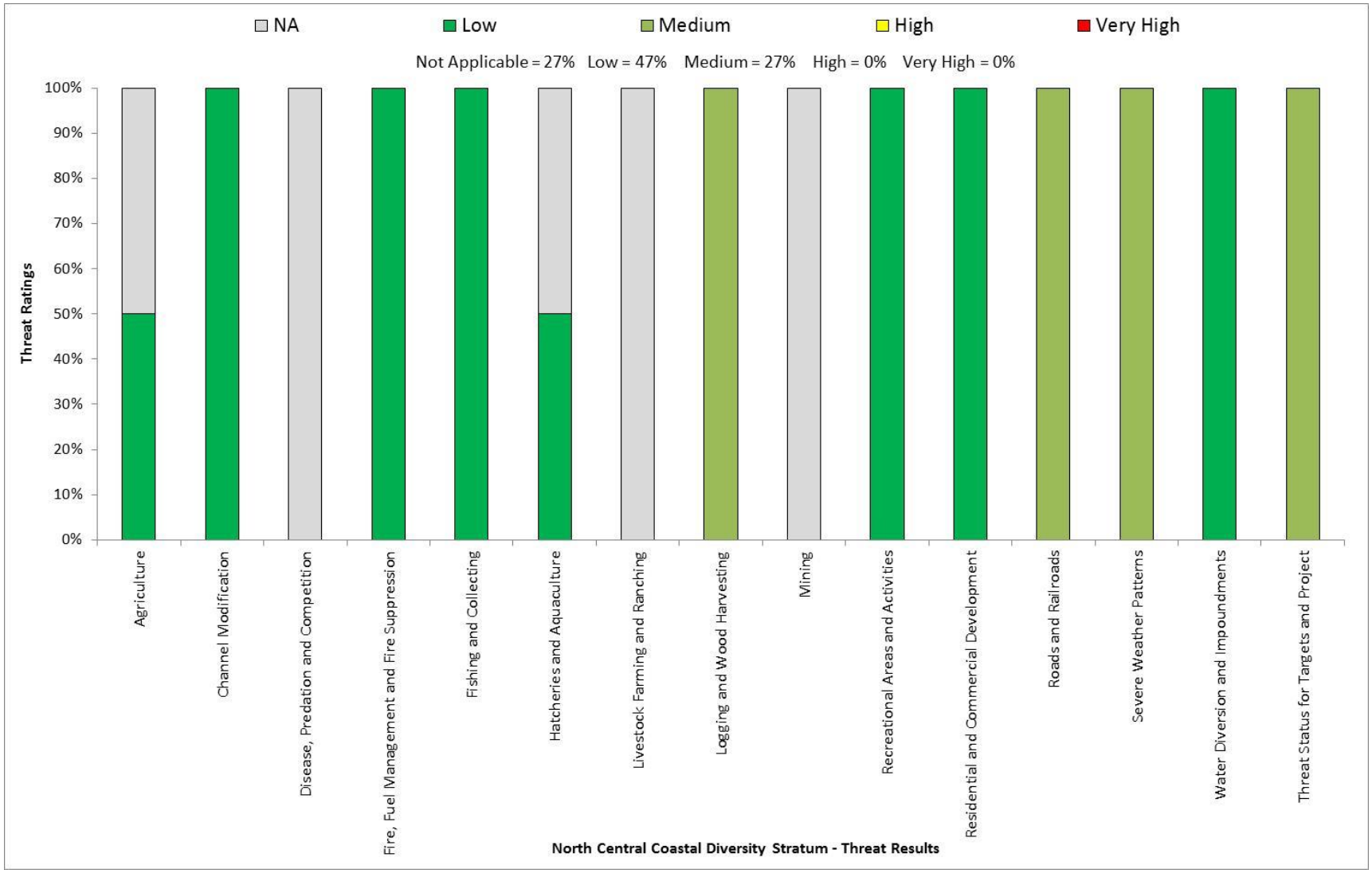

Figure 10: Threat ratings for the North-Central Coastal Diversity Stratum.

Central Coastal Diversity Stratum Results

The Central Coastal Diversity Stratum CAP populations are the Russian River (the most southern and urbanized population in the ESU) and the Garcia River. Chinook salmon have also been observed recently in the Navarro and Gualala rivers, but sightings are uncommon and they are believed to only occur sporadically in these basins.

Attribute Results

Both the Garcia River and Russian River populations were rated Poor for shelter and streamside road density (Table 4). Aside from these two indicators, the Garcia population had Poor ratings for viability indicators but many of the remaining indicators were rated as Good or Very Good. The Russian River population was rated Poor for many other indicators including, estuary/lagoon (pre smolt), habitat complexity (large woody debris, pool/riffle/flatwater ratio), passage/migration (pre smolt), tree diameter, floodplain connectivity, and turbidity (pre smolt). Despite some degraded conditions within the watershed, the Russian River is the only population in the ESU that has recently exhibited a trend toward viability based on increased adult escapement.

Life Stage Results

All lifestages in the stratum are impaired with more than 60% of indicator ratings as either Poor or Fair (Figure 11). Pre smolt is the most impaired lifestage with 69% of indicator ratings reported as Poor or Fair, followed closely by the smolt (69%, but fewer Poor ratings) and adult (67%) lifestages. Attribute indicators most limiting for adults included reduced habitat complexity and low viability. Pre smolt and smolt lifestages were most limited by Poor shelter, Poor estuary/lagoon conditions, and reduced habitat complexity. In the Russian River, pre smolt and smolt are also impaired by degraded riparian conditions (tree diameter), reduced velocity refuge (floodplain connectivity), and elevated turbidity.

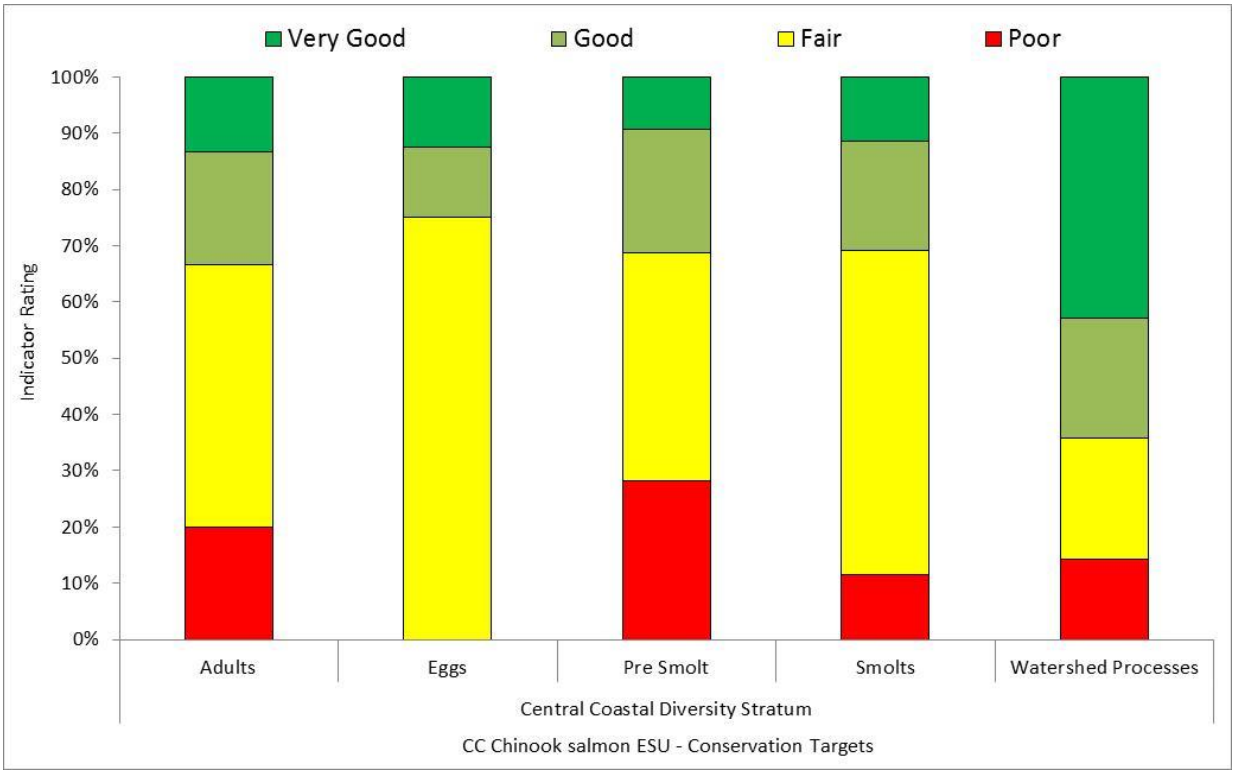

Figure 11: Attribute Indicator Ratings for the Central Coastal Diversity Stratum Conservation Targets.

Threat Results

The most significant threat identified for the Central Coastal Diversity Stratum was roads and railroads (both populations were rated as High) (Table 6 and Figure 12). Channel modification, residential and commercial development, and water diversions and impoundments were also identified as concerns with one of two populations rated as High and the other as medium. There were no Very High threats identified for this stratum. Fire, fuel management and fire suppression as well as recreational areas and activities were considered low threats for both populations in the stratum. Across threats, 3% were rated as not applicable, 31% were rated as Low, 38% were rated as Medium, 31% were rated as High and 0% were rated as Very High (Figure 10).

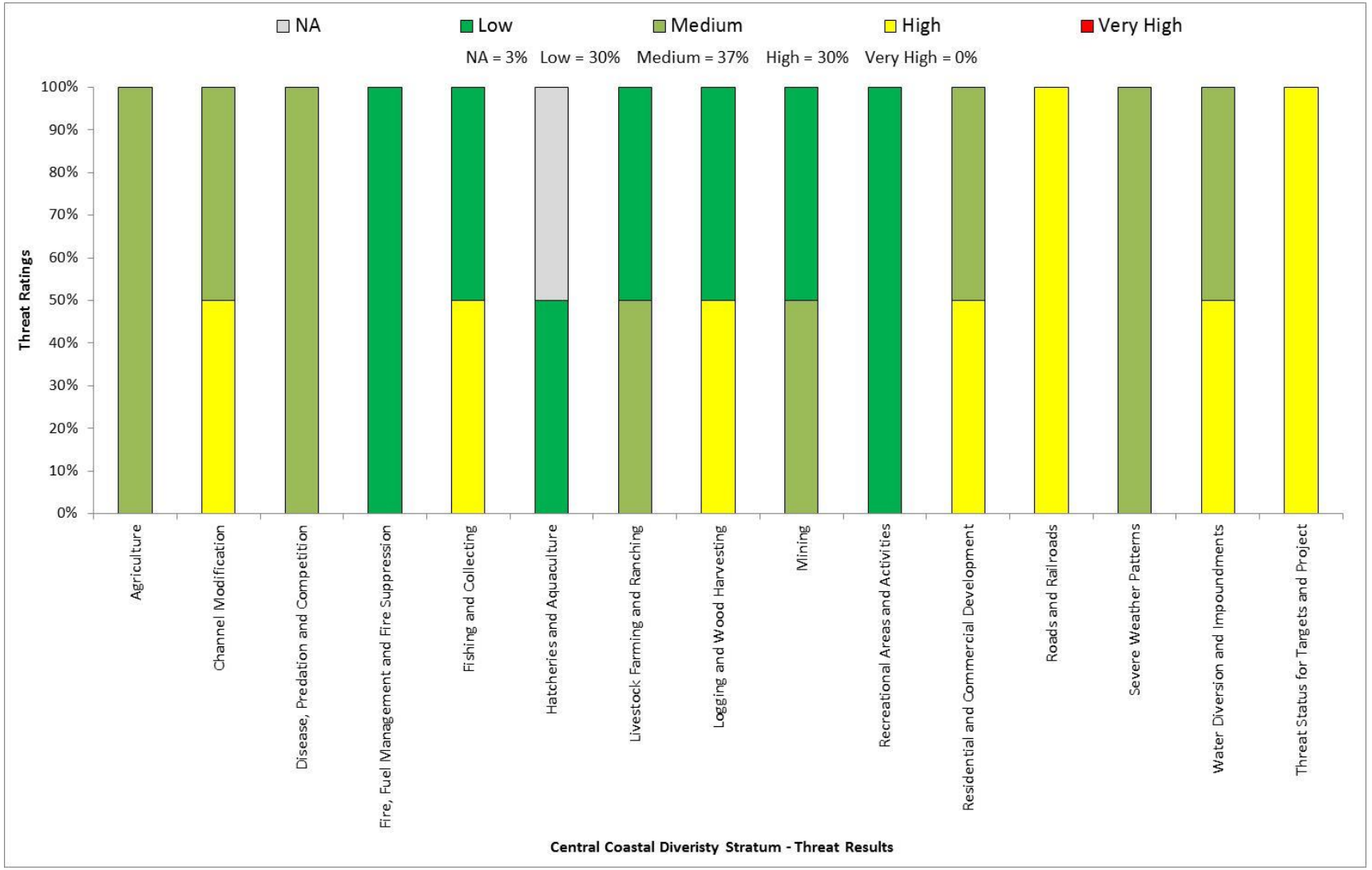

Figure 12: Threat ratings for the Central Coastal Diversity Stratum.

ESU CAP VIABILITY RESULTS

Attributes

Across the ESU and lifestages, viability attribute indicators for habitat complexity (large wood frequency, percent primary pools, pool/riffle/flatwater ratio, and shelter rating) and sediment transport (road density and stream-side road density) were rated Poor (Table 4). In addition, estuary/lagoon (quality and extent) and riparian vegetation (species composition and tree diameter) were rated Poor or Fair for nearly all populations and applicable lifestages.

Attribute indicator ratings that received a high percentage of Good or Very Good ratings throughout the ESU included passage/migration (physical barriers) and watershed processes (impervious surfaces, agriculture, and urbanization (Table 4). These ratings reflect the limited extent of urbanization and agriculture throughout the region.

Table 4: CC Chinook Salmon ESU CAP Viability Summary by Attribute.

CC Chinook Salmon Population Conditions (Sorted By Attribute)			North Coastal							North Mountain Interior			North-Central Coastal		Central Coastal	
Target	Attribute	Indicator	Redwood	Little River	Mad River	Humbold Bay	S. F. Eel River	Bear River	Mattole River	Van Duzen	Larabee Creek	Upper Eel River	Noyo River	Big River	Garcia River	Russian River
Adults	Estuary/Lagoon	Quality & Extent	P	F	G	F	P	F	F	P	P	P	F	F	F	F
Pre Smolt	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	P	P	P	P	F	F	G	P
Smolts	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	P	P	P	P	F	F	F	F
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	F	V	F	P	P	F	F	P	P	F	G	P
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	P	F	F	P	P	P	F	F	P	P	P	F	P
Pre Smolt	Habitat Complexity	Percent Primary Pools	G	F	P	V	F	G	F	P	F	P	F	P	V	F
Adults	Habitat Complexity	Percent Staging Pools	P	F	P	P	P	P	P	P	F	F	F	P	V	F
Adults	Habitat Complexity	Pool/Riffle/Flatw ater Ratio	P	P	P	V	F	P	F	F	F	P	P	P	V	P
Pre Smolt	Habitat Complexity	Pool/Riffle/Flatw ater Ratio	P	P	P	V	F	P	F	F	F	F	G	P	V	P
Pre Smolt	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Pre Smolt	Hydrology	Flow Conditions (Baseflow)	F	G	G	G	P	G	P	P	P	F	G	F	F	F
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	G	G	V	V	G	G	G	G	G	F	G	G	F	F
Pre Smolt	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Smolts	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Watershed Processes	Hydrology	Impervious Surfaces	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Pre Smolt	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	F	G	G	V	V	G	F
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	F	G	G	V	V	G	F
Adults	Hydrology	Passage Flow s	F	V	G	G	F	G	F	P	F	G	V	G	F	G
Pre Smolt	Hydrology	Passage Flow s	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Smolts	Hydrology	Passage Flow s	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Eggs	Hydrology	Redd Scour	P	V	G	P	F	G	F	F	F	F	F	F	F	F
Watershed Processes	Landscape Patterns	Agriculture	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	V	P	G	P	G	G	V	P	P	V	F	V	G	V
Watershed Processes	Landscape Patterns	Urbanization	V	V	V	P	V	V	V	V	V	V	V	V	V	F
Adults	Passage/Migration	Passage at Mouth or Confluence	F	G	G	G	P	V	F	P	G	F	V	G	F	F
Pre Smolt	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	F	V	G	F	P
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	G	V	G	F	F
Adults	Passage/Migration	Physical Barriers	V	V	V	G	V	V	V	G	V	F	V	V	V	V
Smolts	Passage/Migration	Physical Barriers	V	V	V	V	V	V	V	G	V	V	V	V	V	V
Watershed Processes	Riparian Vegetation	Species Composition	F	F	F	G	F	P	F	V	G	F	F	F	G	F
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	F	F	F	F	P	P	F	F	P	P	F	F	F	P
Pre Smolt	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	P	P	F	F	P	P	F	F	F	P
Eggs	Sediment	Gravel Quality (Bulk)	F	F	V	G	P	F	P	P	G	F	F	F	F	G
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	F	G	F	G	P	P	F	P	F	F	V	F
Adults	Sediment	Quantity & Distribution of Spaw ning Gravels	F	F	G	F	G	P	F	F	F	G	G	G	F	G
Pre Smolt	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Smolts	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Watershed Processes	Sediment Transport	Road Density	P	P	P	P	P	P	F	P	P	G	P	G	G	F
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Smoltification	Temperature	P	V	F	G	P	F	P	F	F	F	F	F	F	F
Adults	Velocity Refuge	Floodplain Connectivity	P	G	G	P	F	F	P	F	G	F	F	F	G	F
Pre Smolt	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	G	P
Smolts	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	G	F
Smolts	Viability	Abundance	F	P	G	F	F	F	P	F	F	F	P	P	P	F
Adults	Viability	Density	F	P	F	P	F	F	F	F	F	F	P	P	P	F
Adults	Viability	Spatial Structure	G	F	V	P	G	V	F	P	G	F	P	P	P	F
Pre Smolt	Viability	Spatial Structure	G	F	V	P	G	V	P	P	G	F	P	P	P	F
Pre Smolt	Water Quality	Temperature (MWMT)	P	V	F	G	F	F	P	F	G	F	G	G	G	F
Adults	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	G	F	G	F
Pre Smolt	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Smolts	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Adults	Water Quality	Turbidity	P	P	F	P	P	F	P	P	F	F	F	F	G	F
Pre Smolt	Water Quality	Turbidity	P	P	P	P	F	F	P	P	F	F	F	V	G	P
Smolts	Water Quality	Turbidity	P	P	F	F	P	F	P	P	F	F	F	F	G	F

Table 5: CC Chinook Salmon ESU CAP Viability Summary by Conservation Target.

CC Chinook Salmon Population Conditions (Sorted By Conservation Target)			North Coastal							North Mountain Interior			North-Central Coastal		Central Coastal	
Target	Attribute	Indicator	Redwood	Little River	Mad River	Humbold Bay	S. F. Eel River	Bear River	Mattole River	Van Duzen	Larabee Creek	Upper Eel River	Noyo River	Big River	Garcia River	Russian River
Adults	Estuary/Lagoon	Quality & Extent	P	F	G	F	P	F	F	P	P	P	F	F	F	F
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	P	P	F	V	F	P	P	F	F	P	P	F	G	P
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	P	P	F	F	P	P	P	F	F	P	P	P	F	P
Adults	Habitat Complexity	Percent Staging Pools	P	F	P	P	P	P	P	P	F	F	F	P	V	F
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	P	V	F	P	F	F	F	P	P	P	V	P
Adults	Hydrology	Passage Flows	F	V	G	G	F	G	F	P	F	G	V	G	F	G
Adults	Passage/Migration	Passage at Mouth or Confluence	F	G	G	G	P	V	F	P	G	F	V	G	F	F
Adults	Passage/Migration	Physical Barriers	V	V	V	G	V	V	V	G	V	F	V	V	V	V
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	F	F	F	F	P	P	F	F	P	P	F	F	F	P
Adults	Sediment	Quantity & Distribution of Spawning Gravels	F	F	G	F	G	P	F	F	F	G	G	G	F	G
Adults	Velocity Refuge	Floodplain Connectivity	P	G	G	P	F	F	P	F	G	F	F	F	G	F
Adults	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	G	F	G	F
Adults	Water Quality	Turbidity	P	P	F	P	P	F	P	P	F	F	F	F	G	F
Adults	Viability	Density	F	P	F	P	F	F	F	F	F	F	P	P	P	F
Adults	Viability	Spatial Structure	G	F	V	P	G	V	F	P	G	F	P	P	P	F
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	G	G	V	V	G	G	G	G	G	F	G	G	F	F
Eggs	Hydrology	Redd Scour	P	V	G	P	F	G	F	F	F	F	F	F	F	F
Eggs	Sediment	Gravel Quality (Bulk)	F	F	V	G	P	F	P	P	G	F	F	F	F	G
Eggs	Sediment	Gravel Quality (Embeddedness)	G	P	F	G	F	G	P	P	F	P	F	F	V	F
Pre Smolt	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	P	P	P	P	F	F	G	P
Pre Smolt	Habitat Complexity	Percent Primary Pools	G	F	P	V	F	G	F	P	F	P	F	P	V	F
Pre Smolt	Habitat Complexity	Pool/Riffle/Flatwater Ratio	P	P	P	V	F	P	F	F	F	F	G	P	V	P
Pre Smolt	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Pre Smolt	Hydrology	Flow Conditions (Baseflow)	F	G	G	G	P	G	P	P	P	F	G	F	F	F
Pre Smolt	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Pre Smolt	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	F	G	G	V	V	G	F
Pre Smolt	Hydrology	Passage Flows	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Pre Smolt	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	F	V	G	F	P
Pre Smolt	Riparian Vegetation	Tree Diameter (North of SF Bay)	P	F	F	F	P	P	F	F	P	P	F	F	F	P
Pre Smolt	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Pre Smolt	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	G	P
Pre Smolt	Water Quality	Temperature (MWMT)	P	V	F	G	F	F	P	F	G	F	G	G	G	F
Pre Smolt	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Pre Smolt	Water Quality	Turbidity	P	P	P	P	F	F	P	P	F	F	F	V	G	P
Pre Smolt	Viability	Spatial Structure	G	F	V	P	G	V	P	P	G	F	P	P	P	F
Smolts	Estuary/Lagoon	Quality & Extent	P	F	F	F	P	F	P	P	P	P	F	F	F	F
Smolts	Habitat Complexity	Shelter Rating	P	F	P	P	P	P	P	P	P	P	P	P	P	P
Smolts	Hydrology	Flow Conditions (Instantaneous Condition)	F	G	V	V	F	G	P	F	F	G	G	G	F	F
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	F	G	F	F	P	G	P	F	G	G	V	V	G	F
Smolts	Hydrology	Passage Flows	F	V	V	V	F	G	P	F	F	G	G	G	F	G
Smolts	Passage/Migration	Passage at Mouth or Confluence	G	G	G	G	F	V	P	F	G	G	V	G	F	F
Smolts	Passage/Migration	Physical Barriers	V	V	V	V	V	V	V	G	V	V	V	V	V	V
Smolts	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	G	P	V	G	F	G	P	P	F	P	F	F	V	F
Smolts	Smoltification	Temperature	P	V	F	G	P	F	P	F	F	F	F	F	F	F
Smolts	Velocity Refuge	Floodplain Connectivity	P	G	G	P	P	F	P	F	G	F	F	F	G	F
Smolts	Water Quality	Toxicity	F	G	G	F	F	G	G	F	G	F	F	F	G	F
Smolts	Water Quality	Turbidity	P	P	F	F	P	F	P	P	F	F	F	F	G	F
Smolts	Viability	Abundance	F	P	G	F	F	F	P	F	F	F	P	P	P	F
Watershed Processes	Hydrology	Impervious Surfaces	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Agriculture	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Watershed Processes	Landscape Patterns	Timber Harvest	V	P	G	P	G	G	V	P	P	V	F	V	G	V
Watershed Processes	Landscape Patterns	Urbanization	V	V	V	P	V	V	V	V	V	V	V	V	V	F
Watershed Processes	Riparian Vegetation	Species Composition	F	F	F	G	F	P	F	V	G	F	F	F	G	F
Watershed Processes	Sediment Transport	Road Density	P	P	P	P	P	P	F	P	P	G	P	G	G	F
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Life Stages

The viability attribute results indicate all lifestages of CC Chinook salmon are impaired in each Diversity Strata (Table 5 and Figure 13). Adults are the most impaired lifestage across the ESU with 71% of all indicator ratings reported as Poor or Fair, followed by the pre smolt (67%), smolt (63%), and egg (57%) lifestages (Figure 13). The pre smolt and adult lifestages had the highest percentage of Poor ratings overall (30%). Watershed processes, on an ESU level, had a combined 44% of attribute indicators reported as Poor or Fair (Figure 13), of which 32% were rated as Poor.

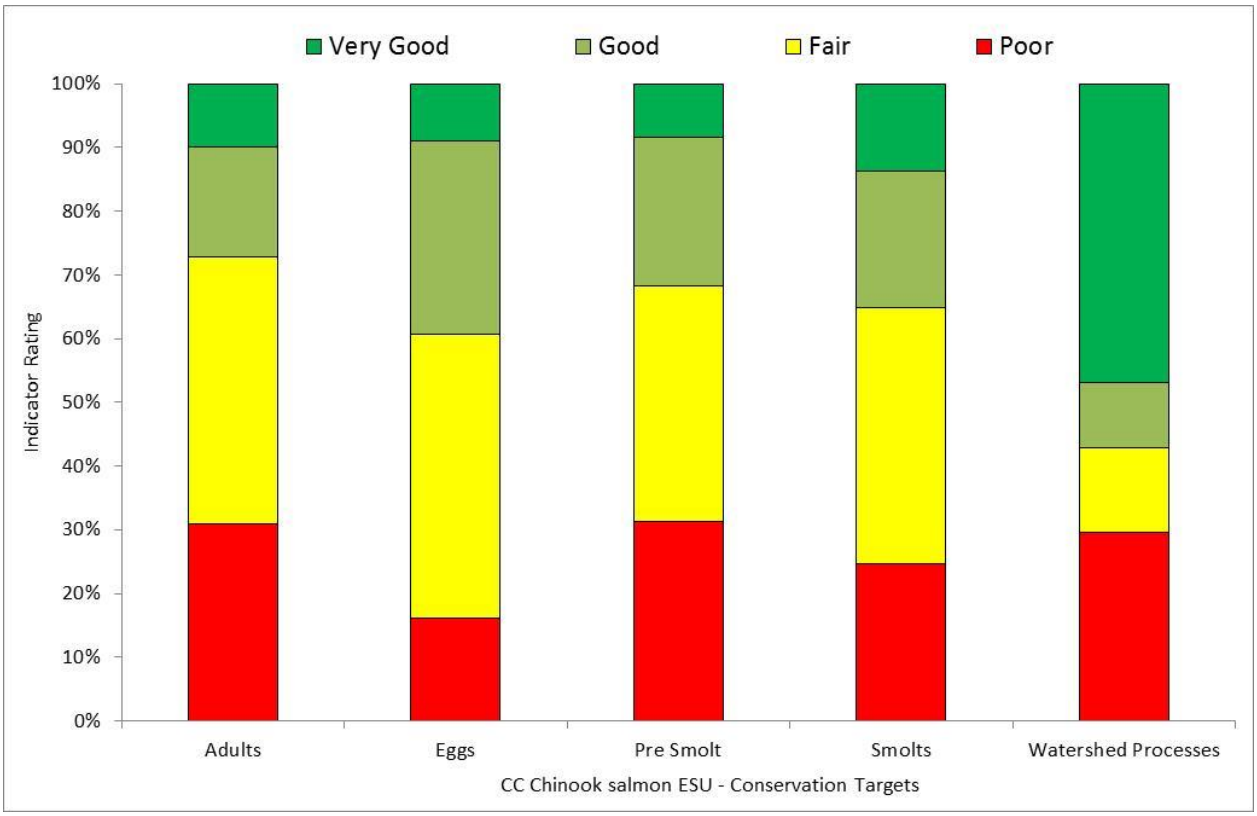

Figure 13: Attribute Indicator ratings for the CC Chinook salmon ESU by lifestage.

Adults Attribute Results: Across the ESU, most indicators for the adult lifestage had a high percentage (> 60%) of Poor or Fair ratings with the exceptions being passage flows, passage at mouth or confluence, physical barriers, quality and distribution of spawning gravels, and toxicity (Figure 14). The four indicators of greatest concern, based on the percentage of Poor

ratings alone were large wood frequency (BFW 0-10m and BFW 10-100m), percent staging pools, and pool/riffle/flatwater ratio. Across all attributes, 31% were rated Poor, 42% were rated Fair, 17% were rated Good and 10% were rated as Very Good (Figure 14).

Eggs Attribute Results*:* Of the four indicators applicable to the egg lifestage, the most concerning were those related to gravel quality (embeddedness) followed by gravel quantity (bulk), and the potential for redd scour, which is related to overall gravel quality (Figure 15). Across all attributes, 16% were rated Poor, 45% were rated Fair, 30% were rated Good and 9% were rated as Very Good (Figure 15).

Pre Smolt Attribute Results*:* Like adults, most indicator ratings for the pre smolt lifestage had a high percentage (> 60%) of Poor or Fair ratings (Figure 16) with the exceptions being flow conditions (base flow and instantaneous), stream flow diversions, passage flows, passage flows at mouth or confluence, and toxicity. The indicators of greatest concern were estuary/lagoon quality and extent, shelter rating, turbidity, tree diameter, and viability (spatial structure) (Figure 16). Across all attributes, 31% were rated Poor, 37% were rated Fair, 23% were rated Good and 8% were rated as Very Good (Figure 16).

Smolt Attribute Results*:* More than half of the indicator ratings (7 out of 13) for the smolt lifestage had a high percentage (> 60%) of Poor or Fair ratings (Figure 17) with the exceptions being flow conditions, stream flow diversions, passage flows, passage at mouth or confluence, physical barriers, and toxicity. The indicators of greatest concern for the smolt lifestage were estuary/lagoon quality and extent, shelter rating, gravel quality, viability (abundance) and temperature. Across all attributes, 25% were rated Poor, 40% were rated Fair, 21% were rated Good and 14% were rated as Very Good (Figure 17).

Watershed Processes Results*:* Road density and streamside road density are the greatest overall source of impairment to current watershed conditions followed by timber harvest (Figure 18). Streamside road density was rated Poor for all populations. The extent of impervious surfaces

and agriculture received Very Good ratings throughout the ESU. Across all attributes, 30% were rated Poor, 13% were rated Fair, 10% were rated Good and 47% were rated as Very Good (Figure 18).

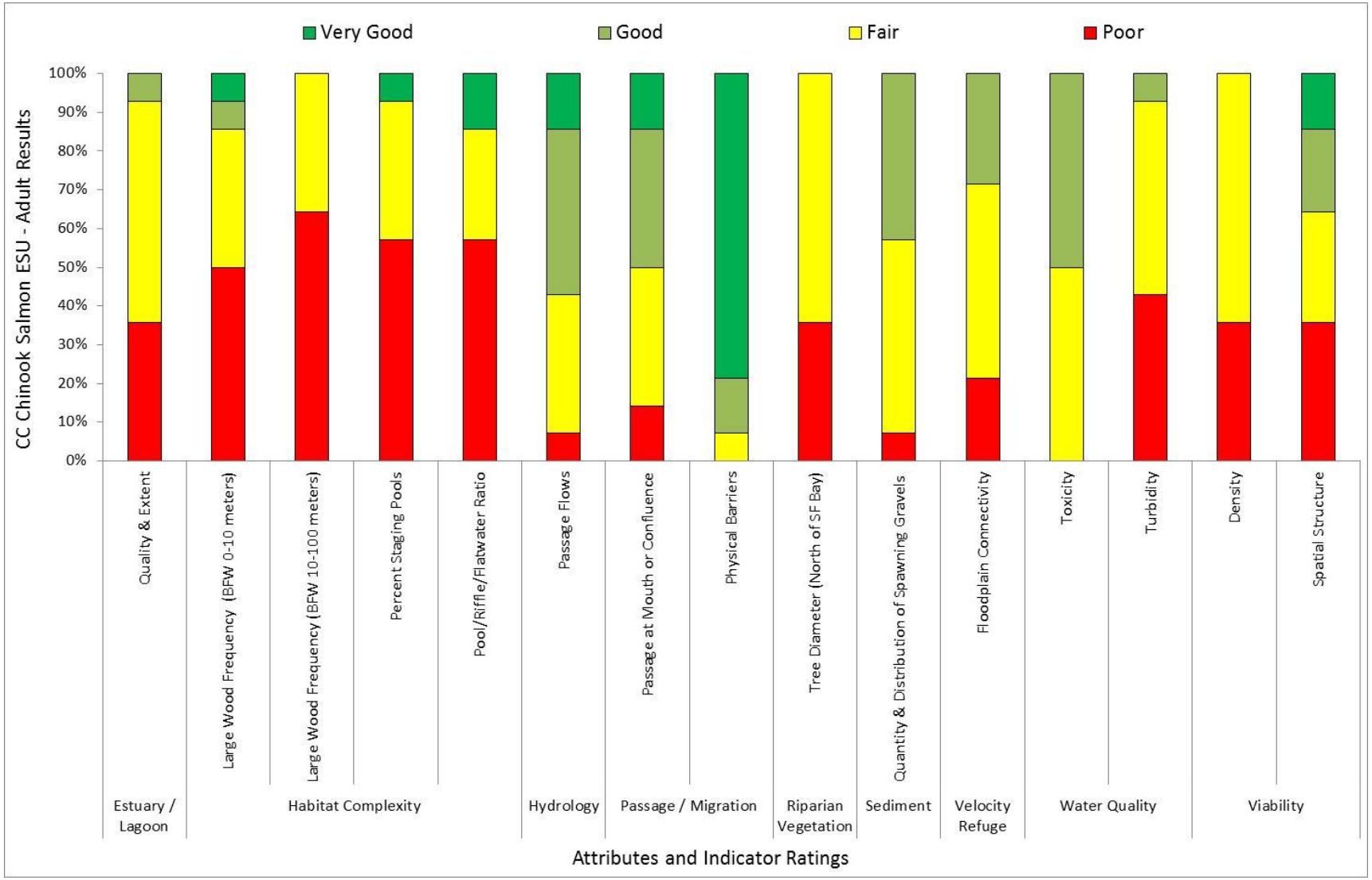

Figure 14: Attribute Indicator ratings for the Adult lifestage.

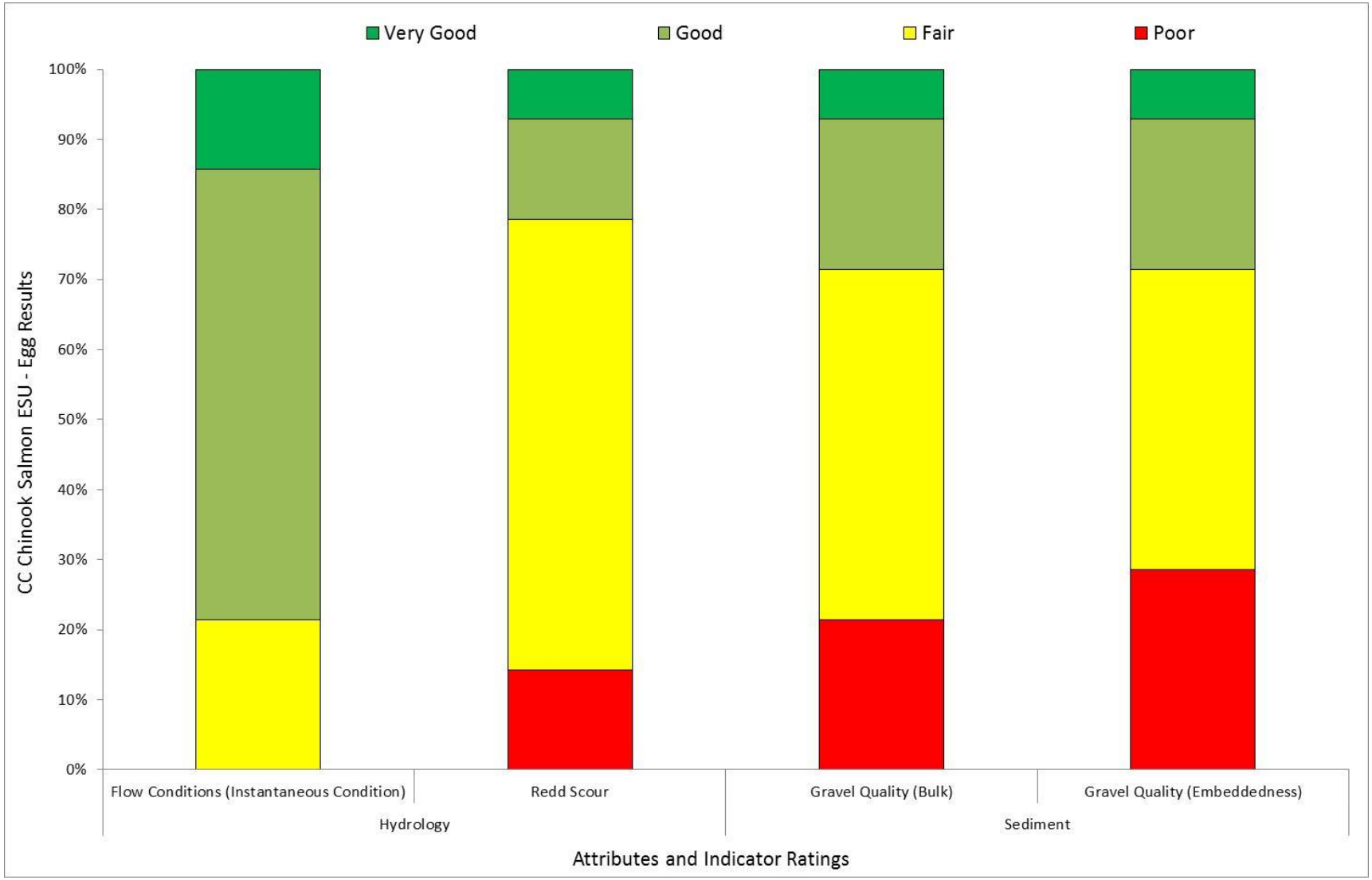

Figure 15: Attribute Indicator ratings for the Egg lifestage.

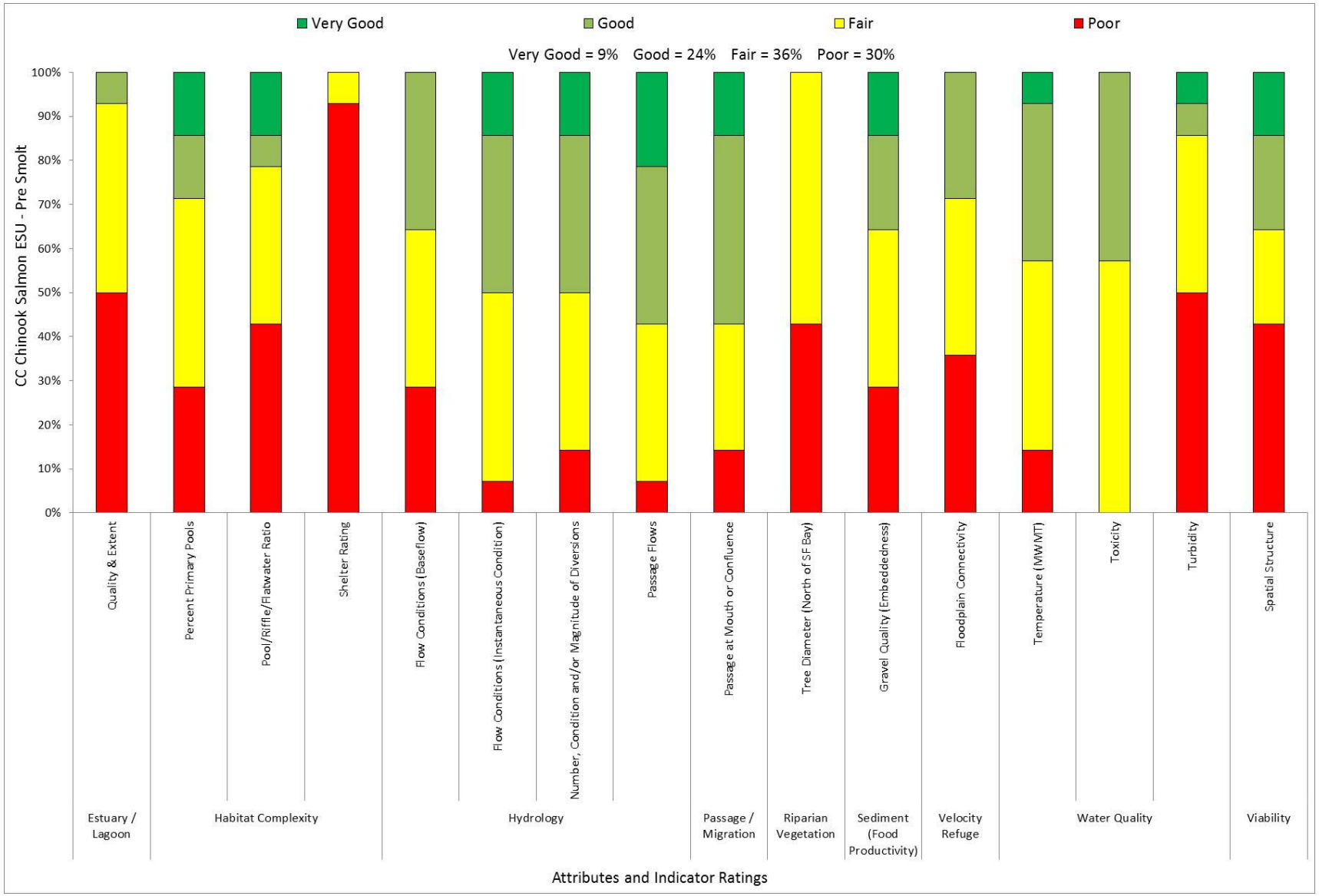

Figure 16: Attribute Indicator ratings for the Pre Smolt lifestage.

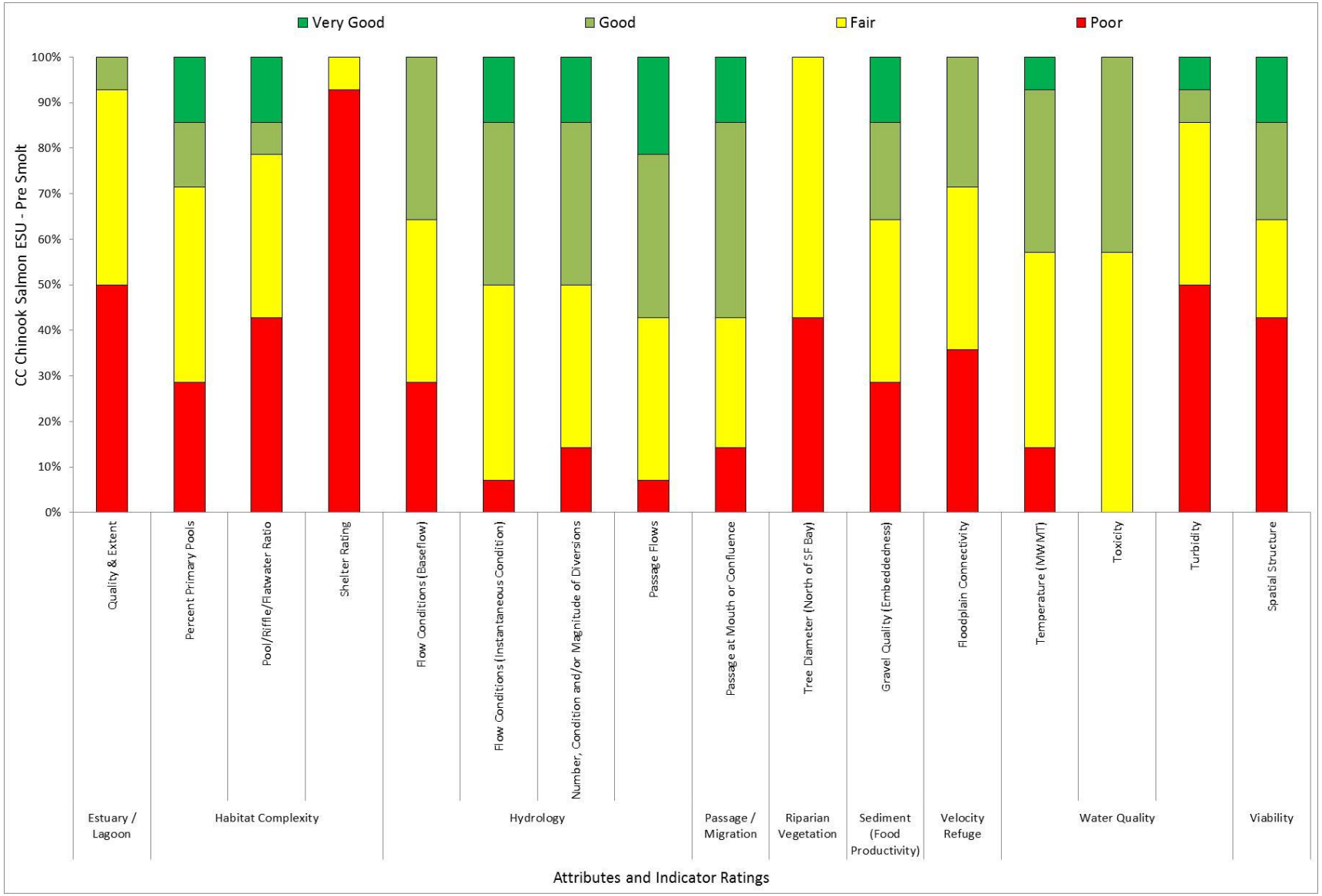

Figure 17: Attribute Indicator ratings for the Smolt lifestage.

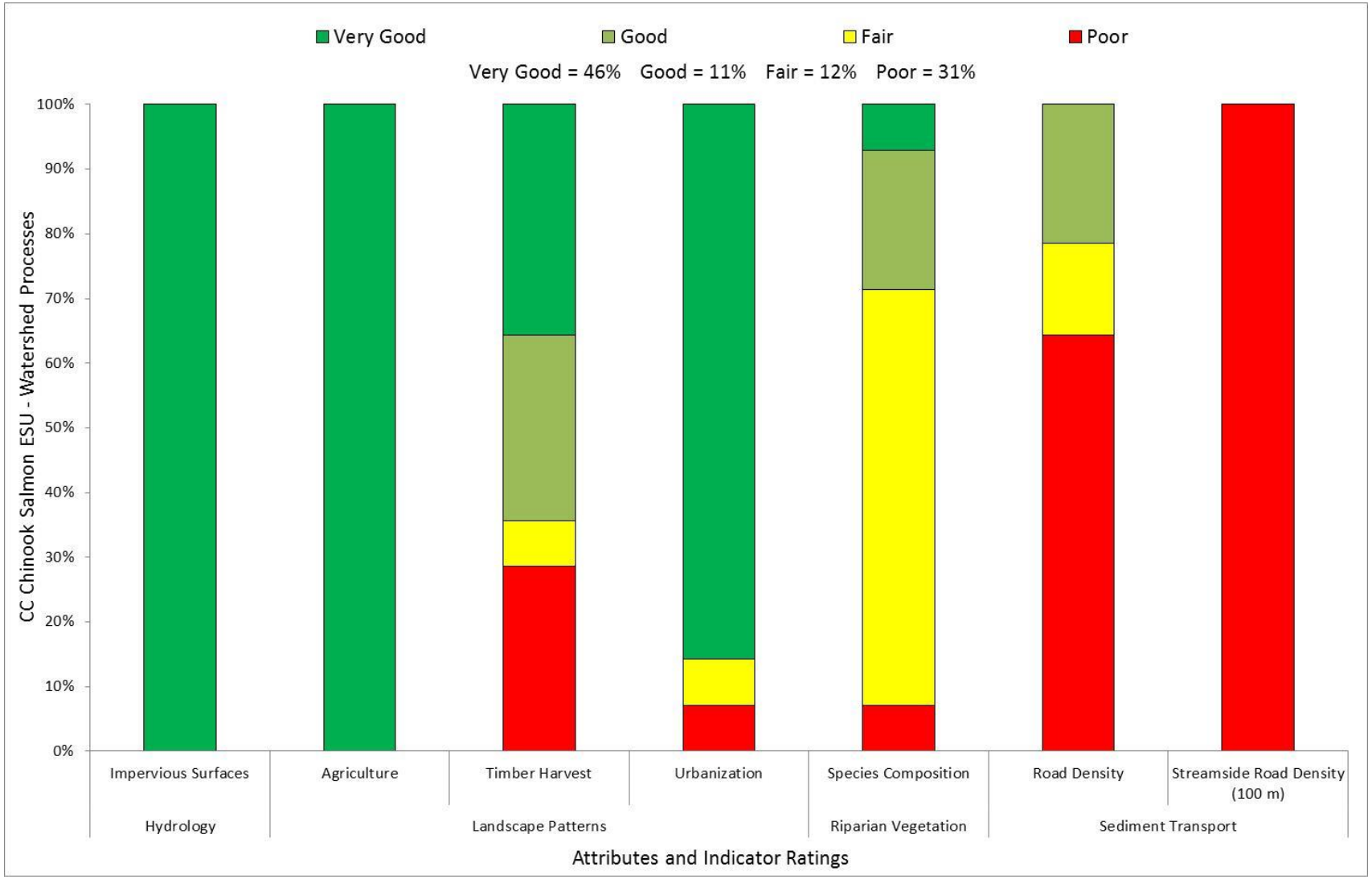

Figure 18: Attribute Indicator ratings for Watershed Processes.

ESU CAP THREAT RESULTS

Table 6 summarizes the CAP threat results across the ESU. Of the 15 identified threats, the four threats of greatest concern throughout the ESU based on the percentage of High and Very High ratings are channel modification (50%), roads and railroads (57%), logging and wood harvesting (36%), and both water diversion and impoundments and severe weather patterns (29%) (Figure 19).

Table 6: CC Chinook salmon ESU Threat Summary Table. Cells with [-] were not rated or not applicable.

Diversity Strata	North Coastal							North Mountain Interior			North-Central Coastal		Central Coastal	
CC Chinook Threat/Population	Redwood Creek	Little River	Mad River	Humbold Bay	Lower - S. F. Eel River	Bear River	Mattole River	Van Duzen River	Larabee Creek	Upper Eel River	Noyo River	Big River	Garcia River	Russian River
Agriculture	M	M	M	M	M	M	L	M	M	L	L	-	M	M
Channel Modification	VH	H	H	H	H	M	M	H	M	L	L	L	M	H
Disease, Predation and Competition	H	M	M	M	M	M	M	H	H	M	-	-	M	M
Fire, Fuel Management and Fire Suppression	M	M	M	L	M	M	M	M	M	M	L	L	L	L
Fishing and Collecting	L	L	L	M	M	M	L	M	M	L	L	L	H	L
Hatcheries and Aquaculture	L	L	L	M	L	M	L	L	L	L	-	L	-	L
Livestock Farming and Ranching	M	M	M	M	M	H	M	M	M	L	-	-	M	L
Logging and Wood Harvesting	H	H	M	H	M	H	M	M	M	M	M	M	H	L
Mining	H	-	H	L	M	M	M	M	M	L	-	-	L	M
Recreational Areas and Activities	M	M	M	L	M	M	M	M	M	L	L	L	L	L
Residential and Commercial Development	M	M	M	M	M	M	M	M	M	L	L	L	M	H
Roads and Railroads	H	H	H	M	H	H	M	M	M	H	M	M	H	H
Severe Weather Patterns	H	M	M	H	H	M	H	M	M	M	M	M	M	M
Water Diversion and Impoundments	M	M	M	M	H	M	H	H	M	L	L	L	M	H
Threat Status for Targets and Project	VH	H	H	H	H	VH	H	H	H	H	M	M	H	H

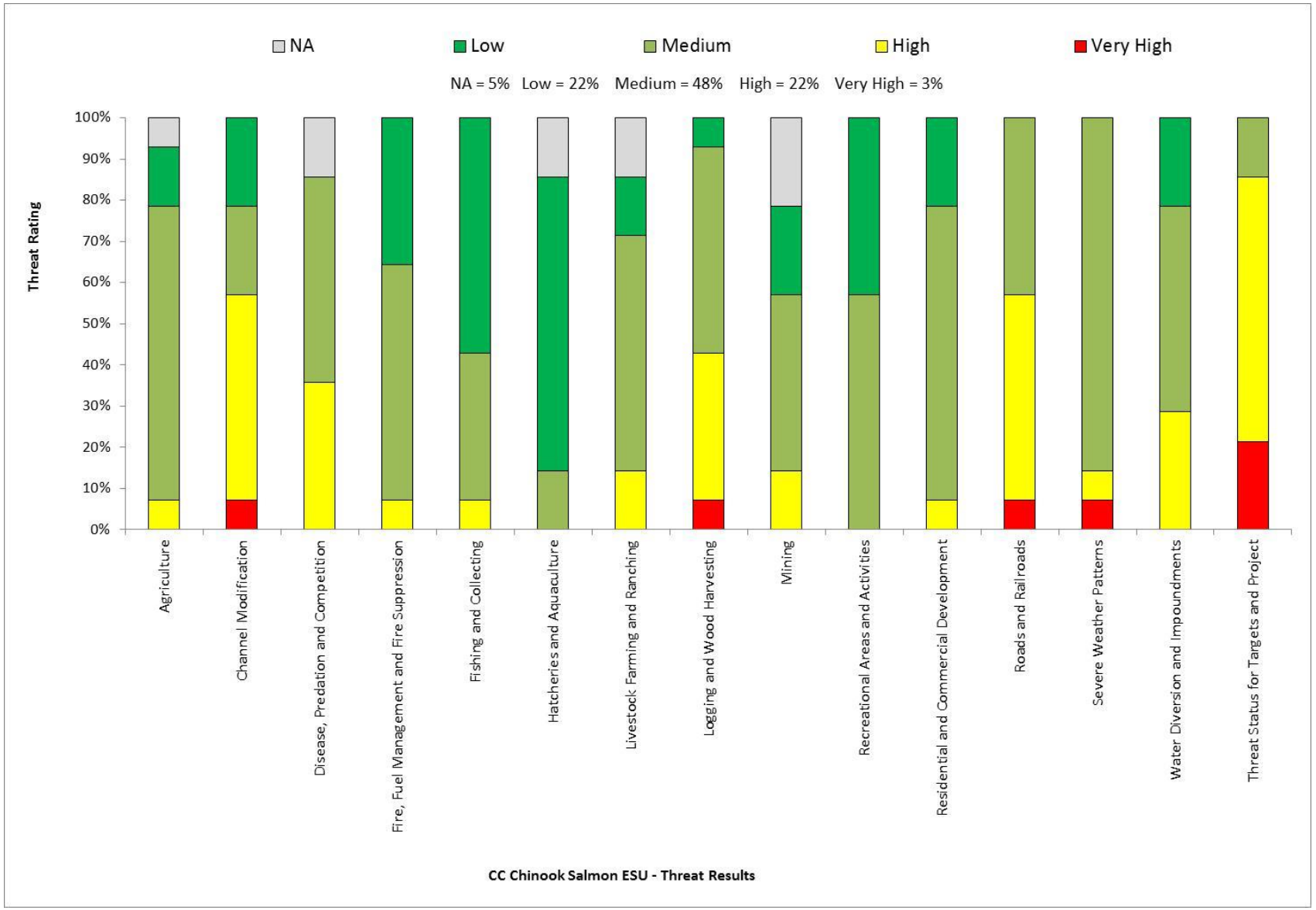

Figure 19: Threat ratings for the CC Chinook salmon ESU.

ESU LEVEL RECOVERY ACTIONS

The following recovery actions are ESU-wide recovery actions. ESU-wide recovery actions are recommendations that are designed to address widespread and often multiple threat sources across the range, such as the inadequate implementation and enforcement of local, state, and federal regulations.

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-1.1	Estuary	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-1.1.1	Estuary	Recovery Action	Increase quality and extent of estuarine habitat.										
ESU-CCCh-1.1.1.1	Estuary	Action Step	In estuary/lagoons when applicable, remove problematic infrastructure and fill material to promote the historical seasonal formation and timing of an estuary/lagoon barrier breach	3	20	County, State, NMFS						TBD	Cost is dependent on the infrastructure of fill to be removed
ESU-CCCh-1.1.1.2	Estuary	Action Step	Implement patrols by citizens groups, city employees, and law enforcement to ensure seasonal sandbars are not illegally breached.	1	50	City, Citizens, County, CDFW Wardens, NMFS OLE, Non-Profits, Private Landowners,						0	Action is considered In-Kind
ESU-CCCh-1.2	Estuary	Objective	Address the inadequacy of existing regulatory mechanisms.										
ESU-CCCh-1.2.1	Estuary	Recovery Action	Increase quality and extent of estuarine habitat.										
ESU-CCCh-1.2.1.1	Estuary	Action Step	Develop and implement Estuary Inflow Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.	2	20	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-1.2.1.2	Estuary	Action Step	Work with local county/city and state organizations to develop alternative methods of flood control to reduce artificial breaching frequency.	2	10	City, County, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-2.1	Floodplain Connectivity	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
ESU-CCCh-2.1.1	Floodplain Connectivity	Recovery Action	Rehabilitate and enhance floodplain connectivity										
ESU-CCCh-2.1.1.1	Floodplain Connectivity	Action Step	Evaluate opportunities and implement actions for planned retreat of urban development or other incompatible land uses from floodplains (similar to the City of Napa, CA) and alluvial valley streams to recreate natural floodplain processes and complex off-channel habitat and implement such opportunities where appropriate.	2	50	City, County						TBD	In-Kind for the evaluation, TBD for the implementation of the plan
ESU-CCCh-2.2	Floodplain Connectivity	Objective	Address the inadequacy of existing regulatory mechanisms										
ESU-CCCh-2.2.1	Floodplain Connectivity	Recovery Action	Rehabilitate and enhance floodplain connectivity										
ESU-CCCh-2.2.1.1	Floodplain Connectivity	Action Step	County zoning should consider the 20-year and 100-year floodprone areas and design protective ordinances and compatible land use designations in these locations.	2	50	County						0	Action is considered In-Kind
ESU-CCCh-3.1	Hydrology	Objective	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
ESU-CCCh-3.1.1	Hydrology	Recovery Action	Improve flow conditions										
ESU-CCCh-3.1.1.1	Hydrology	Action Step	Encourage water conservation and the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	2	50	EPA, City, County, NGO, Private Landowners, State, RWQCB						0	Action is considered In-Kind
ESU-CCCh-3.1.1.2	Hydrology	Action Step	Work with rural residential communities to develop water conservation strategies protective of salmonids while allowing for domestic water use.	2	20	City, County, NGO, Private Landowners, State, SWRCB						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-3.1.1.3	Hydrology	Action Step	Work with partners to reduce stormwater run-off by removing impervious surfaces, and creating or expanding flood retention land and groundwater recharge basins.	3	20	City, County, Private Landowners, State, SWRCB						0	Action is considered In-Kind
ESU-CCCh-3.1.1.4	Hydrology	Action Step	Work with the RWQCBs to encourage landowners to increase groundwater recharge, permeable surfaces, and percolation through swales and recharge basins in an effort to reduce the flashiness of hydrographs and increase summer baseflow.	1	20	NMFS, Private Landowners, State, RWQCB						0	Action is considered In-Kind
ESU-CCCh-3.1.1.5	Hydrology	Action Step	Work with partners to expand stream flow gaging networks in streams supporting salmonids and/or their habitat.	3	50	CDFW, City, County, NMFS, Private Landowners, State, SWRCB, USGS						TBD	Costs for implementing this action will depend on the number, location and duration of gages across the ESU and DPS. See also Monitoring Chapter.
ESU-CCCh-3.1.1.6	Hydrology	Action Step	Meter water diversions for the purposes of measuring instantaneous demand.	2	5	CDFW, City, County, NMFS, Private Landowners, State, SWRCB						0	Implementation costs should be covered under existing laws or should be the responsibility of the entity that owns the diversion.
ESU-CCCh-3.1.1.7	Hydrology	Action Step	Provide financial and technical support and develop partnerships to characterize watershed hydrology and to assess water availability and create water resource budgets.	1	10	CDFW, City, County, NMFS, State, SWRCB						TBD	Some of this would be In-Kind
ESU-CCCh-3.1.1.8	Hydrology	Action Step	Effects of consumptive water uses on both the timing and quantity of flow should be minimized. Water-management technologies promoting restoration of natural runoff patterns and water quality should be encouraged.	1	10	CDFW, City, County, NMFS, State, SWRCB						0	Patterns of water runoff, including surface and subsurface drainage, should match to the greatest extent possible the natural hydrologic pattern for the region in both quantity and quality. Action is considered In-Kind
ESU-CCCh-3.1.1.9	Hydrology	Action Step	Evaluate geological patterns in the ESU to identify areas with karst formations or similar geology. These sites may provide sources of cool water and serve as locations to buffer populations against climate change and on-going water diversions.	3	15	County, NMFS, State, USGS						TBD	
ESU-CCCh-3.2	Hydrology	Objective	Address the inadequacy of existing regulatory mechanisms										
ESU-CCCh-3.2.1	Hydrology	Recovery Action	Improve flow conditions										
ESU-CCCh-3.2.1.1	Hydrology	Action Step	Encourage local governments to condition new development to reduce or eliminate human water demand by integrating hydro-modification concerns into development planning.	2	50	City, County						0	For example: new homes should have drought-tolerant landscaping, rainwater catchment systems, and permeable surfaces; new vineyards should demonstrate that their water supply development would have no adverse impacts of fisheries resources. Action is In-Kind
ESU-CCCh-3.2.1.2	Hydrology	Action Step	SWRCB in coordination with NMFS, CDFW, and other qualified parties, should develop state-wide minimum summer baseflow requirements protective of salmonids and their habitat.	1	5	CDFW, NMFS, SWRCB						0	Enforcing the minimum baseflow requirement is necessary to ensure salmonid persistence during drought periods and water right curtailment or when watershed surface flow is over-allocated, and when prosecuting illegal diversions. Action is In-Kind
ESU-CCCh-3.2.1.3	Hydrology	Action Step	Improve coordination between the agencies, particularly with the SWRCB, to effectively identify and address illegal water diverters and out-of-compliance diverters, seasons of diversion, off-stream reservoirs, and bypass flows fully protective of listed salmonids.	1	5	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-3.2.1.4	Hydrology	Action Step	Collaborate with and support the SWRCB and local agencies to increase oversight and responsibility for regulating groundwater extraction from aquifers hydrologically connected to surface flows.	1	5	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB						0	Action is considered In-Kind
ESU-CCCh-3.2.1.5	Hydrology	Action Step	NMFS should actively participate in Groundwater Management Plan development (per California's Sustainable Groundwater Management Act) where groundwater pumping is impacting hydrologically connected streamflow.	1	5	City, County, CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-3.2.1.6	Hydrology	Action Step	Encourage local governments to integrate meaningful groundwater regulation for land use planning and to increase coordination with State agencies to ensure applicants secure necessary State permits (e.g., water rights) as part of local permitting processes.	1	5	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB						0	Action is considered In-Kind
ESU-CCCh-3.2.1.7	Hydrology	Action Step	Extend California Water Code Section 1259.4 dealing with instream flows to protect instream beneficial uses, including native fishes, to central and northern California recovery planning areas with appropriate provisions to address regional differences, including but not limited to construction of off-stream storage as alternative to direct diversions during the dry season.	1	5	SWRCB						0	Action is considered In-Kind
ESU-CCCh-3.2.1.8	Hydrology	Action Step	Water conservation projects should be focused on shifting reliance from on-stream storage to offstream storage, resolve frost protection issues, and ensure necessary flows for all freshwater lifestages in all water years.	2	10	City, County, CDFW, NMFS, Private Landowners, RWQCB, SWRCB						TBD	
ESU-CCCh-5.1	Passage	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
ESU-CCCh-5.1.1	Passage	Recovery Action	Modify or remove physical passage barriers.										
ESU-CCCh-5.1.1.1	Passage	Action Step	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) need to accommodate 100-year flood flows and associated bedload and debris.	2	50	City, County, NMFS, State						TBD	
ESU-CCCh-5.1.1.2	Passage	Action Step	Monitor and update barriers in the Passage Assessment Database (PAD) (https://nrm.dfg.ca.gov/PAD/)	3	50	City, County, NGO, RCD, State						0	The data that is collected is often part of another survey and is forwarded to CDFW. CDFW maintenance of the database is considered In-Kind
ESU-CCCh-6.2	Habitat Complexity	Objective	Address the inadequacy of existing regulatory conditions										
ESU-CCCh-6.2.1	Habitat Complexity	Recovery Action	Improve shelter										
ESU-CCCh-6.2.1.1	Habitat Complexity	Action Step	Work with Federal and State to develop an application of a programmatic permit for restoration work not funded by FRGP. The objectives of the programmatic should be to reduce costs and fast-track the implementation of high priority recovery actions.	2	5	City, County, CDFW, NGO, NMFS, NOAA RC, Private Landowners, RCD						0	Action is considered In-Kind
ESU-CCCh-6.2.1.2	Habitat Complexity	Action Step	Work with California BOF, CDFW, RWQCB and others to modify the timber harvest permitting process (including CDFW Lake and Streambed Alteration Agreement process) and provide opportunities and incentives for the implementation of LWD placement and other restoration priorities during timber harvest operations.	3	5	BOF, CDFW, NMFS, RWQCB, Timber Landowners						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-6.2.1.3	Habitat Complexity	Action Step	Work with CDFW and the California Fish and Game Commission to remove beavers from California Fish and Game Code Section 4181 that provides any owner or tenant of land or property that is being damaged or destroyed or is in danger of being damaged or destroyed by certain mammals, including beaver, may apply to the department for a permit to kill the mammals.	3	10	CDFW, California Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-6.2.1.4	Habitat Complexity	Action Step	Work with CDFW and the California Fish and Game Commission to modify Title 14 of the California code of Regulations to prohibit recreational hunting/trapping of beavers within all counties within the NCCC Recovery Domain.	3	10	CDFW, California Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-6.2.1.5	Habitat Complexity	Action Step	Utilize non-lethal methods where feasible to manage beaver depredation issues (e.g. flooding, crop damage) such as flow devices, fencing, and beaver re-location and enhance habitat complexity.	3	10	CDFW, California Fish and Game Commission, NMFS, Private Landowners						TBD	
ESU-CCCh-6.2.1.6	Habitat Complexity	Action Step	Where non-lethal methods prove unfeasible to resolve depredation issues, relocate beaver populations to remote streams where habitat enhancement is needed and resource conflict is low.	3	10	CDFW, California Fish and Game Commission, NMFS, Private Landowners						0	Action is considered In-Kind
ESU-CCCh-6.2.1.7	Habitat Complexity	Action Step	Develop and update a Beaver Management Plan for California to benefit salmonids.	3	10	CDFW, California Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-7.1	Riparian	Objective	Address the inadequacy of existing regulatory conditions										
ESU-CCCh-7.1.1	Riparian	Recovery Action	Improve riparian conditions										
ESU-CCCh-7.1.1.1	Riparian	Action Step	Develop adequately sized riparian setbacks/buffers to protect salmonids habitat where they do not currently occur, and enforce requirements of local regulations where they do.	2	10	County						0	Action is considered In-Kind
ESU-CCCh-7.1.1.2	Riparian	Action Step	Counties should develop a riparian strategy to grow older larger diameter trees for improved canopy and appropriate natural recruitment to the stream. This could be achieved by creating ordinances (where currently non-existent) that limit or prevent the removal of mature trees during infrastructure upgrades or implementation of restoration projects.	3	10	County						0	Action is considered In-Kind
ESU-CCCh-8.1	Sediment	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-8.1.1	Sediment	Recovery Action	Improve instream gravel quality										
ESU-CCCh-8.1.1.1	Sediment	Action Step	Fund and implement sediment TMDLs within the range of listed salmonids.	2	10	EPA, RWQCB						TBD	
ESU-CCCh-8.1.1.2	Sediment	Action Step	Evaluate stream crossings for their potential to impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.	2	10	Caltrans, County, CDFW, NMFS						TBD	
ESU-CCCh-10.1	Water Quality	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-10.1.1	Water Quality	Recovery Action	Reduce toxicity and pollutants.										

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-10.1.1.1	Water Quality	Action Step	Work with EPA, RWQCBs and CDFW to identify and prioritize potential contaminants of concern and develop protective standards and programs for issues that directly or indirectly adversely affect the continued existence of listed salmonids.	2	5	EPA, CDFW, RWQCB						0	Action is considered In-Kind
ESU-CCCh-10.1.1.2	Water Quality	Action Step	Conduct outreach to increase awareness of the effects of pesticides and contaminants that impact the continued existence and habitat of listed salmonids.	2	5	EPA, CDFW, NGO, NMFS, RWQCB						0	Action is considered In-Kind
ESU-CCCh-10.1.1.3	Water Quality	Action Step	Support the development and implementation of stormwater BMPs in cities, towns and rural areas.	2	5	City, County, Local, Private Landowners, State, RWQCB						0	Action is considered In-Kind
ESU-CCCh-10.1.1.4	Water Quality	Action Step	Implement performance standards in Stormwater Management Plans.	2	5	City, County, Private Landowners, State, RWQCB						0	Action is considered In-Kind
ESU-CCCh-10.1.1.5	Water Quality	Action Step	Work with pesticide users to educate and advocate for an "integrative pest management framework (IPM)" for pesticide control.	2	5	City, County, NMFS, Private Landowners, State, RWQCB						0	Best management practices within the IPM include biological control, pesticide choices, removal of pest habitat and resources, barriers, optimal fertilization and irrigation, trap plants, intercropping, and cover crops, and synthetic mulches. Action is considered In-Kind
ESU-CCCh-10.1.1.6	Water Quality	Action Step	Work with the California Department of Pesticide Regulation (CDPR) to support changes to professional pesticide application methodologies and timing to limit the potential exposure of watercourses to pesticide runoff.	3	5	City, County, NMFS, Private Landowners, State, RWQCB						0	For example: change building infrastructure applications of pyrethorids on monthly schedules throughout the entire year including the rainy season to seasons of interest. Action is considered In-Kind
ESU-CCCh-10.1.1.7	Water Quality	Action Step	Work with the academic, local, government and non-profit entities (Natural Resource Conservation District, etc.) to support funding of research and use of pesticide alternatives.	3	15	Academic, Local, Government, NGO						0	These alternatives may include technologies that reduce the amount of pesticides that need to be applied or pest management strategies that require very little pesticide use. Action is considered In-Kind
ESU-CCCh-10.1.1.8	Water Quality	Action Step	Work with EPA, RWQCBs, and local stakeholders to implement actions under section 303(d)(1)(C) and (D) of the Clean Water Act requiring States to prepare TMDLs for all water bodies targeted in this recovery plan not currently meeting State of California water quality standards.	2	25	EPA, NMFS, RWQCB, State						0	Action is considered In-Kind
ESU-CCCh-10.2	Water Quality	Objective	Address Inadequacy of existing regulatory conditions										
ESU-CCCh-10.2.1	Water Quality	Recovery Action	Reduce toxicity and pollutants.										
ESU-CCCh-10.2.1.1	Water Quality	Action Step	Work with the RWQCB to support and fast track promulgation of methods to detect impacts from pesticides and other CECs under 40 C.F.R. Part 136, followed by adoption of water quality criteria for pollutants covered by these methods.	2	10	NMFS, RWQCB, State						0	Action is considered In-Kind
ESU-CCCh-11.1	Viability	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-11.1.1	Viability	Recovery Action	Increase abundance, spatial structure and diversity										
ESU-CCCh-11.1.1.1	Viability	Action Step	Finalize and implement the California Coastal Salmonid Monitoring Plan.	1	50	CDFW, County, NGO, RCD, Watershed Partners, Water Agencies						TBD	Implementing the California Coastal Monitoring Plan is essential for evaluating the long-term viability of listed salmonids in California. For specific components of the Coastal Monitoring Plan see Vol.1 Chapter 6.
ESU-CCCh-11.1.1.2	Viability	Action Step	Prioritize restoration funds, notably the Pacific Coast Salmon Restoration Fund and California's Fisheries Restoration Grant Program (FRGP), to address issues in critical watersheds identified within this recovery plan.	2	50	CDFW, NMFS						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-11.1.1.3	Viability	Action Step	Work with the SWFSC to revise the "Intrinsic Potential" model in areas where the model predictions has a severe or high bias.	2	5	NMFS, SWFSC						0	Action is considered In-Kind
ESU-CCCh-11.1.1.4	Viability	Action Step	Support all educational and outreach conferences, events, workshops, etc. that advance the understanding of anadromous salmonid life history, ecology, history, biology, threats, habitat restoration, recovery, and species viability to include all those with a science, restoration, and policy focus.	2	50	Academic, CDFW, NGO, NMFS, SWFSC						TBD	
ESU-CCCh-11.1.1.5	Viability	Action Step	Support studies, assessments, science, research, and monitoring (including associated modeling, data management, data analysis, and reporting) that will improve our understanding of species life history and genetic diversity, historical distribution, habitat relationships, status, trends, viability, and spatial structure including those for drought and climate change	2	50	Academic, CDFW, NGO, NMFS, SWFSC						TBD	
ESU-CCCh-12.1	Agriculture	Objective	Address the present of threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-12.1.1	Agriculture	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-12.1.1.1	Agriculture	Action Step	Continue existing cooperative conservation programs (such as Fish Friendly Farming or Fish Friendly Ranching) in order to minimize the impacts of agricultural operations on habitat quality.	2	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State						TBD	
ESU-CCCh-12.1.1.2	Agriculture	Action Step	Encourage and assist the NRCS and RCDs to increase the number of landowners participating in sediment reduction planning and implementation.	2	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State						0	Action is considered In-Kind
ESU-CCCh-12.1.1.3	Agriculture	Action Step	Develop incentive programs and incentive-based approaches for landowners who conduct operations in a manner compatible with salmonid recovery requirements.	3	20	NMFS, NRCS, Private Landowners, RCD, RWQCB, State						0	In-Kind to develop the program, TBD depending on what incentives are provided
ESU-CCCh-12.1.1.4	Agriculture	Action Step	Continue and expand the use of cover crops in agriculture fields to reduce sediment runoff.	3	10	Private Landowners						0	In-Kind, should be considered standard practice, but implementation is ultimately up to the landowner
ESU-CCCh-12.1.2	Agriculture	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-12.1.2.1	Agriculture	Action Step	Support projects that build agricultural ponds as an alternative to summer riparian diversions.	2	15	NMFS, NRCS, Private Landowners, RCD, RWQCB, State, SWRCB						0	Action is considered In-Kind
ESU-CCCh-12.1.2.2	Agriculture	Action Step	If water is used for frost protection measures, encourage SWRCB to require the use of flow metering in such circumstances to ensure flows are maintained for other beneficial uses.	2	5	NMFS, Private Landowners, RWQCB, State, SWRCB						0	Action is considered In-Kind
ESU-CCCh-12.1.2.3	Agriculture	Action Step	Utilize BMP's for irrigation (cover crop, drip) and frost protection (wind machines, cold air drains, heaters, or micro-sprayers) which eliminate or minimize water use.	2	10	NMFS, NRCS, Private Landowners, RCD, RWQCB, State						TBD	
ESU-CCCh-12.1.2.4	Agriculture	Action Step	Re-design levee systems to back-flood alluvial basin recharge zones in flood tolerant agricultural areas.	3	20	Corps, County, NMFS						0	Action is considered In-Kind
ESU-CCCh-12.2	Agriculture	Objective	Address the inadequacies of existing regulatory mechanisms.										
ESU-CCCh-12.2.1	Agriculture	Recovery Action	Prevent or minimize impairment to watershed hydrology										

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-12.2.1.1	Agriculture	Action Step	NMFS and CDFW should request to be included as technical experts in ongoing legislative efforts to craft marijuana cultivation regulations.	2	5	CDFW, NMFS						0	Action is considered In-Kind
ESU-CCCh-12.2.1.2	Agriculture	Action Step	Counties should condition approval of new developments (e.g. vineyards) in order to require developers to demonstrate that water is available, without adversely affecting public trust resources.	2	10	County, Private, SWRCB						0	Action is considered In-Kind
ESU-CCCh-12.2.1.3	Agriculture	Action Step	Promote the use of reclaimed waste water for agricultural, landscape and other appropriate applications.	2	10	City, County, Private, NMFS, State, RWQCB, SWRCB						0	Action is considered In-Kind
ESU-CCCh-12.2.1.4	Agriculture	Action Step	Encourage the use of low-flow alternatives such as micro-sprinklers, and encourage alternative forms of frost protection that do not use water, such as wind machines.	2	10	City, County, Private Landowners, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-12.2.1.5	Agriculture	Action Step	NMFS and CDFW should work with state/federal attorneys and the Counties District Attorney's office to coordinate prosecutorial strategies for environmental crimes arising from marijuana cultivation.	1	5	CDFW, County, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-12.2.2	Agriculture	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-12.2.2.1	Agriculture	Action Step	Minimize impacts from new vineyard development by enforcement of land use zoning appropriate to the site to protect floodplain and riparian processes.	2	20	County, CDFW, NMFS						0	Action is considered In-Kind
ESU-CCCh-13.1	Channel Modification	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-13.1.1	Channel Modification	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-13.1.1.1	Channel Modification	Action Step	Collaborate with local, state, and federal agencies and non-governmental organizations to acquire fee-title to parcels or conservation easements over strategically-selected stream and riparian corridors to protect salmon and steelhead migratory, spawning, and rearing habitats.	3	50	City, County, Federal, Local, NGO, State						TBD	
ESU-CCCh-13.1.1.2	Channel Modification	Action Step	Eliminate the use of gabion baskets and undersized rock within the bankfull channel. Where riprap and other bank hardening is necessary, integrate other habitat-forming features – including large woody debris and riparian plantings and other methodologies to minimize habitat alteration effects.	2	10	City, County, Private Landowner, State, Water Agencies						TBD	
ESU-CCCh-13.1.1.3	Channel Modification	Action Step	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Focus on ensuring minimal disruption to watershed processes.	2	10	City, County, Private Landowner, State, Water Agencies						TBD	
ESU-CCCh-13.2	Channel Modification	Objective	Address the inadequacy of existing regulatory mechanisms.										
ESU-CCCh-13.2.1	Channel Modification	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-13.2.1.1	Channel Modification	Action Step	Encourage Counties and municipalities to adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	15	County, County Municipalities, NMFS						0	Action is considered In-Kind
ESU-CCCh-13.2.1.2	Channel Modification	Action Step	Encourage FEMA to set regulatory standards in its Flood Insurance Program to explicitly address the protection of natural fluvial processes essential for the maintenance of naturally functioning riverine and riparian habitats.	2	15	FEMA, NMFS						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-14.1	Disease/Predation/Competition	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-14.1.1	Disease/Predation/Competition	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
ESU-CCCh-14.1.1.1	Disease/Predation/Competition	Action Step	Provide funding to investigate and remediate impacts of disease and predation to overall viability.	3	20	Academic, CDFW, NMFS, SWFSC						TBD	
ESU-CCCh-14.1.1.2	Disease/Predation/Competition	Action Step	Evaluate impacts of striped bass predation in coastal estuaries to juvenile and smolt salmonids and implement abatement strategies where appropriate.	2	10	CDFW, NMFS						TBD	See Monitoring Chapter
ESU-CCCh-14.1.1.3	Disease/Predation/Competition	Action Step	Support CDFW, and other resource agencies to control and contain invasive species in California.	2	10	CDFW, NMFS						0	Action is considered In-Kind
ESU-CCCh-14.1.1.4	Disease/Predation/Competition	Action Step	Provide support to the Invasive Species Council of California (ISCC), and the California Invasive Species Advisory Committee (CISAC) in their efforts to effectively control invasive species.	2	10	CISAC, ISCC, NMFS						0	Action is considered In-Kind
ESU-CCCh-14.1.1.5	Disease/Predation/Competition	Action Step	Work with Counties to modify existing tree ordinances (e.g., Heritage Tree Ordinance) to exclude protection of non-native trees (e.g., *Eucalyptus* sp.) and waive any associated fees for non-native tree removal, particularly when part of a restoration project or on pubic lands.	3	10	County, NMFS, CDFW						0	Action is considered In-Kind
ESU-CCCh-14.1.1.6	Disease/Predation/Competition	Action Step	Promote the practice of Clean, Drain, and Dry for watercraft and equipment used in aquatic environments. Additional information can be found at https://www.wildlife.ca.gov/Conservation/Invasives	2	5	Citizens, CDFW, NMFS						0	Action is considered In-Kind
ESU-CCCh-15.1	Fire/Fuel Management	Objective	Address the inadequacy of existing regulatory mechanisms.										
ESU-CCCh-15.1.1	Fire/Fuel Management	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-15.1.1.1	Fire/Fuel Management	Action Step	Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.	2	10	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind
ESU-CCCh-15.1.1.2	Fire/Fuel Management	Action Step	Identify historical fire frequency, intensities and durations and manage fuel loads in a manner consistent with historical parameters.	2	10	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind
ESU-CCCh-15.1.1.3	Fire/Fuel Management	Action Step	Include CDFW and NMFS participation on rehabilitation planning teams. During rehabilitation, consider leaving felled trees in streams as LWD source. Re-contour massively modified areas. Storm-proof roads immediately after use. Dispose of suitable organic materials by dispersing them on disturbed soils on the contour. Where larger organic material is available, place in severely burned-out watercourses (assure CDFW/NMFS is a part of this design and decision). Seeding, preferably with local seed-stock, at high hazard/risk areas should be done whenever feasible.	2	10	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind
ESU-CCCh-15.1.1.4	Fire/Fuel Management	Action Step	Establish fire contingency plans that involve CalFire, local fire districts and regulatory agencies with expertise in fisheries issues.	2	10	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind
ESU-CCCh-15.1.2	Fire/Fuel Management	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ESU-CCCh-15.1.2.1	Fire/Fuel Management	Action Step	Disseminate recommendations from NMFS' October 9, 2007, jeopardy biological opinion on the use of fire retardants and its impacts to salmonids, to local firefighting agencies and CalFire.	2	5	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-15.1.2.2	Fire/Fuel Management	Action Step	Locate chemicals, petroleum products, latrines, camp sites, etc., out of riparian buffer and place on flat ground.	2	5	CalFire, CDFW, Local Fire Districts, NMFS						0	Action is considered In-Kind
ESU-CCCh-15.1.3	Fire/Fuel Management	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-15.1.3.1	Fire/Fuel Management	Action Step	Obtain water from lakes and reservoirs not occupied by listed salmonids when possible. Require all water trucks/tenders be fitted with CDFW and NMFS approved fish screens when water is acquired at fish bearing streams. Put up a silt fence or other erosion controls around the water extraction locations. Avoid significantly lower stream flows during water drafting.	2	100	CalFire, CDFW, Local Fire Districts, NMFS						TBD	NMFS anticipates that it will take up to 5 years for this to be implemented but should continue in perpetuity
ESU-CCCh-16.1	Fishing/Collecting	Objective	Address the overutilization for commercial, recreational, scientific or educational purposes.										
ESU-CCCh-16.1.1	Fishing/Collecting	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
ESU-CCCh-16.1.1.1	Fishing/Collecting	Action Step	Fishery managers should work with NMFS to develop Fishery Management and Evaluation Plans to prevent extinction and ensure fishery management is consistent with recovery of the species, and cover incidental take of federally listed salmonids.	1	5	CDFW, CA Fish and Game Commission, NMFS SFD, SWFSC						0	Action is considered In-Kind
ESU-CCCh-16.1.1.2	Fishing/Collecting	Action Step	Collaborate with CDFW to develop appropriate fisheries data in select indicator watersheds that will support Fishery Management and Evaluation Plans (FMEPs).	1	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.3	Fishing/Collecting	Action Step	Work with CDFW and Fish and Game Commission to refine freshwater sport fishing regulations to minimize unintentional and unauthorized take, and incidental mortality, of listed species by anglers during the migration period. This effort could include development of specific emergency regulations during adult migration periods between September and January, low-flow closures (much like Washington State) and angler outreach programs.	1	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.4	Fishing/Collecting	Action Step	Work with CDFW to develop protective regulations and seek funds for additional Game Wardens to minimize impacts from fishing during the migratory period (e.g., until sandbars open naturally) within one mile of the river mouths of watersheds with essential or supporting populations.	1	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.5	Fishing/Collecting	Action Step	Improve CDFW's Freshwater Sport Fishing Regulations by considering prohibiting removal of wild salmonids from the water in catch-and-release fisheries.	2	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.6	Fishing/Collecting	Action Step	Consider additional data/information requirements on the Steelhead Report Card. Consider the recording of Chinook and coho salmon incidental catch and if they are of wild or hatchery origin (adipose clipped).	2	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.7	Fishing/Collecting	Action Step	Utilizing the "reminder postcard" in efforts to increase Steelhead Report Card (SRC) return rates has worked well and is applauded by fisheries managers. Work with CDFW to consider providing, additional incentives to return SRCs by the January 31 deadline to save time and money while gaining more angler participation, which will provide more accurate information for agency evaluation.	2	5	CDFW, CA Fish and Game Commission, NMFS						TBD	Example: Oregon DFW holds a drawing each year for anglers that return their salmon/steelhead/sturgeon/halibut harvest cards before the pre-determined date. Prizes are substantial, typically including a drift boat etc.

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-16.1.1.8	Fishing/Collecting	Action Step	Work with CDFW to bring more awareness to special salmonid conservation propagation programs and improve salmonid identification outreach; especially in areas where a mixed stock fishery occurs (example: Russian River).	2	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.9	Fishing/Collecting	Action Step	Consider banning felt sole wading boots in California waters in efforts to minimize or eliminate the spread of aquatic diseases and invasive species (example: didymo, New Zealand mud snails, whirling disease, etc.).	2	5	CDFW, CA Fish and Game Commission, NMFS						0	Action is considered In-Kind
ESU-CCCh-16.1.1.10	Fishing/Collecting	Action Step	Consider other incentives for greater angler participation in fisheries restoration efforts.	2	10	CDFW, CA Fish and Game Commission, NMFS						TBD	For example, the Game Warden Stamp is an excellent way to gain more angler and hunter participation and support. Other stamp, sponsorships, and/or lottery fundraising programs that support recovery objectives should be discussed and developed.
ESU-CCCh-16.1.1.11	Fishing/Collecting	Action Step	Collaborate with NOAA OLE, CDFW, Tribes and stakeholders groups to enhance anti-poaching efforts in essential and supporting populations.	2	5	CDFW, Local Citizens, NOAA OLE, Tribes						0	Action is considered In-Kind
ESU-CCCh-16.1.1.12	Fishing/Collecting	Action Step	Determine impacts of ocean fisheries management on CC Chinook salmon in terms of VSP parameters. Identify level of ocean fishing impacts that would not limit attainment of population-specific viability criteria.	1	10	CDFW, CA Fish and Game Commission, NMFS, NMFS SFD, SWFSC						TBD	
ESU-CCCh-16.1.1.13	Fishing/Collecting	Action Step	If actual ocean fishing impacts limit attainment of population-specific viability criteria, modify management so that ocean fishing impacts do not limit attainment of population-specific viability criteria.	1	10	CDFW, CA Fish and Game Commission, NMFS, NMFS SFD						0	Action is considered In-Kind
ESU-CCCh-17.1	Hatcheries	Objective	Address other natural or manmade factors affecting the species' continued existence.										
ESU-CCCh-17.1.1	Hatcheries	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
ESU-CCCh-17.1.1.1	Hatcheries	Action Step	For all hatchery operations, develop and implement HGMPs consistent with 50 CFR 223.203(b)(5) and hatchery criteria identified in Spence et al. (2008).	1	10	CDFW, Hatchery Managers, NMFS						0	Ensure the threat of hatcheries remains low for listed salmonids for current, and all future, hatchery programs. Action is considered In-Kind
ESU-CCCh-17.1.1.2	Hatcheries	Action Step	Hatchery managers need to implement the recommendations in the California Hatchery Scientific Review Group report (California HSRG 2012), where appropriate.	2	10	CDFW, Hatchery Managers, NMFS						TBD	
ESU-CCCh-17.1.1.3	Hatcheries	Action Step	Where applicable, for severely depressed populations investigate the implementation of Conservation Hatchery programs that follow criteria outlined in Spence et al. (2008) and CDFG (2004).	2	20	CDFW, Hatchery Managers, NMFS, SWFSC						TBD	
ESU-CCCh-18.1	Livestock	Objective	Address the present or threatened destruction, modification or curtailment of the species habitat or range.										
ESU-CCCh-18.1.1	Livestock	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-18.1.1.1	Livestock	Action Step	Aid and encourage willing landowners to fence livestock from the stream channel and riparian zones and develop offstream alternative water sources.	2	15	NRCS, RCD, Private Landowners						TBD	
ESU-CCCh-18.1.1.2	Livestock	Action Step	Encourage Livestock and Ranch Managers to utilize Groundwork: A Handbook for Small-Scale Erosion Control in Coastal California (MRCD, 2007), and Management Tips to Enhance Land & Water Quality for Small Acreage Properties (Sotoyome RCD, 2007), and The Grazing Handbook (Sotoyome RCD, 2007).	3	15	NRCS, RCD, Private Landowners						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-18.1.1.3	Livestock	Action Step	Establish conservative residual dry matter (RDM) targets per acre to ensure areas are not overgrazed at the end of grazing season. Remove cattle from pasture before soils dry out.	3	15	NRCS, RCD, Private Landowners						0	Action is considered In-Kind
ESU-CCCh-18.1.1.4	Livestock	Action Step	Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff, improve soil conditions, minimize noxious weeds, and encourage native revegetation.	3	15	NRCS, RCD, Private Landowners						0	
ESU-CCCh-18.1.1.5	Livestock	Action Step	Work with existing cooperative conservation programs (such as Fish Friendly Farming or Fish Friendly Ranching) in order to minimize the impacts of Livestock operations on habitat quality.	3	15	NRCS, NMFS, RCD, Private Landowners						TBD	
ESU-CCCh-18.1.2	Livestock	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ESU-CCCh-18.1.2.1	Livestock	Action Step	Implement practices as outlined in the University of California guidelines for water quality protection (Ristow 2006).	2	10	NRCS, RCD, Private Landowners						TBD	
ESU-CCCh-18.1.2.2	Livestock	Action Step	Implement recommendations of the California Rangeland Water Quality Management Program.	2	10	NRCS, RCD, Private Landowners						TBD	
ESU-CCCh-19.1	Logging	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
ESU-CCCh-19.1.1	Logging	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-19.1.1.1	Logging	Action Step	Encourage development of a GCP/HCP/Natural Community Conservation Plan (NCCP), conservation easements, conservation banks, or safe harbor agreements with industrial or non-industrial forestland owners.	2	50	County, Private Landowners, NMFS, State, Timber Landowners						0	Action is considered In-Kind
ESU-CCCh-19.1.1.2	Logging	Action Step	Investigate opportunities to programmatically permit the forest certification program to authorize incidental take for landowners through ESA Section 10(a)(1)(B).	3	15	NMFS, Private Landowners, Timber Landowners						0	Action is considered In-Kind
ESU-CCCh-19.1.1.3	Logging	Action Step	Consider assigning NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004) and work to implement recommendations as a result of these reviews	3	5	NMFS						0	Action is considered In-Kind
ESU-CCCh-19.1.1.4	Logging	Action Step	The State should consider a Salmonid Watershed Database (similar to the CDFW Northern Spotted Owl database) for RPFs to acquire standardized information on populations and habitat conditions in the watersheds associated with their harvest plan.	3	15	BOF, CDFW, Timber Landowners						TBD	
ESU-CCCh-19.2	Logging	Objective	Address the inadequacy of existing regulatory mechanisms.										
ESU-CCCh-19.2.1	Logging	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-19.2.1.1	Logging	Action Step	Discourage Counties from rezoning forestlands or identified TPZ areas to rural residential or other land uses (e.g., vineyards).	3	50	County, NMFS						0	Action is considered In-Kind
ESU-CCCh-19.2.1.2	Logging	Action Step	Increase THP inspections by CalFire especially during winter months.	3	50	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-19.2.1.3	Logging	Action Step	Encourage to CalFire and BOF to explore a statewide Forestry HCP (similar to that developed in Washington State), GCP, safe harbor agreements, and seek funding opportunities to support the effort.	2	20	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners						0	Action is considered In-Kind
ESU-CCCh-19.2.1.4	Logging	Action Step	Work with the BOF, CalFire, CDFW, professional organizations and landowners to modify the timber harvest permitting process to provide opportunities and incentives for LWD recruitment during timber harvest operations.	1	25	BOF, CalFire, CDFW, NMFS, Private Landowners, Timber Landowners						0	Action is considered In-Kind
ESU-CCCh-19.2.1.5	Logging	Action Step	California BOF could consider requiring (1) EIRs for all forestland conversions, (2) adopting a forestland Conversion THP, (3) elimination of the subdivision exemption, (4) raising forestland conversion permit fees, (5) developing requirements to offset loss of timberland, (6) incentivize restoration of unproductive timberlands, (7) investigate conservation banking programs and (8) coordinate with the other agencies involved for more CalFire oversight on forestland conversions.	1	10	BOF, CDFW, NMFS, Private Landowners, Timber Landowners						TBD	
ESU-CCCh-20.1	Mining	Objective	Address the present or threatened destruction, modification, or curtailment of habitat or range.										
ESU-CCCh-20.1.1	Mining	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-20.1.1.1	Mining	Action Step	In sites with legacy terrace gravel mining pits, remove, setback, or breach levees and re-contour mining pits to an elevation inundated by frequent winter river/stream flows; Restore the inset floodplain at elevation appropriate for modern channel and regulated winter/spring base flows.	2	20	County, EPA, Federal, NMFS, Private, State						TBD	
ESU-CCCh-20.2	Mining	Objective	Address the inadequacy of existing regulations										
ESU-CCCh-20.2.1	Mining	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-20.2.1.1	Mining	Action Step	NMFS National Gravel Extraction Guidance (2005, 2014) should be followed for all existing and proposed projects.	2	20	County, EPA, Federal, NMFS, Private, State						0	Action is considered In-Kind
ESU-CCCh-20.2.1.2	Mining	Action Step	Given the need for enormous amounts of water during fracking, oil companies and state/federal regulators should consult with NMFS/CDFW to ensure adequate water resources exist prior to developing the well. Avoid fracking operations that obtain water from underground aquifers hydrologically connected with surface streamflow.	2	10	County, EPA, Federal, NMFS, Private, State						0	Action is considered In-Kind
ESU-CCCh-20.2.1.3	Mining	Action Step	Evaluate the potential for fracking to impact surface water quality (and thus impact salmon and steelhead) where hydrologic connectivity between ground and surface water exists.	2	10	EPA, NMFS, RWQCB, State						0	Action is considered In-Kind
ESU-CCCh-22.1	Residential/Commercial Development	Objective	Address the present or threatened destruction, modification or curtailment of the species habitat or range.										
ESU-CCCh-22.1.1	Residential/Commercial Development	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ESU-CCCh-22.1.1.1	Residential/Commercial Development	Action Step	Design new developments to avoid or minimize impact to unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to the habitat of listed salmonids.	3	20	City, County, County Planners, Public Works, State						0	Action is considered In-Kind
ESU-CCCh-22.1.2	Residential/Commercial Development	Recovery Action	Prevent or minimize impairment to watershed hydrology										

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-22.1.2.1	Residential/Commercial Development	Action Step	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining a mature and properly functioning riparian zone.	3	5	City, County, County Planners, Public Works, State						0	Action is considered In-Kind
ESU-CCCh-22.1.2.2	Residential/Commercial Development	Action Step	New development in all watersheds with essential and supporting populations should be designed to minimize storm-water runoff and changes in duration or magnitude of peak flow.	3	20	City, County, County Planners, RWQCB, State						0	Action is considered In-Kind
ESU-CCCh-22.2	Residential/Commercial Development	Objective	Address the inadequacy of existing regulatory mechanisms.										
ESU-CCCh-22.2.1	Residential/Commercial Development	Recovery Action	Prevent or minimize impairment to stream hydrology (impaired water flow).										
ESU-CCCh-22.2.1.1	Residential/Commercial Development	Action Step	As mitigation for potential adverse consequences to a watershed's hydrograph, municipalities and counties should develop and implement larger or more effective stormwater detention methods in key watersheds with ongoing channel degradation or in sub-watersheds where impervious surface area > 10 percent.	2	20	CDFW, County, Municipalities, NMFS, SRWCB						0	Action is considered In-Kind
ESU-CCCh-22.2.1.2	Residential/Commercial Development	Action Step	Develop and implement regulations for activities that intercept groundwater recharge.	2	10	CDFW, County, NMFS, SRWCB						0	Action is considered In-Kind
ESU-CCCh-22.2.1.4	Residential/Commercial Development	Action Step	Work with partners to develop legislation that will fund county planning for environmentally sound growth and water supply development and work in coordination with California Dept. of Housing, and other government associations (CDFG 2004).	2	30	County, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-22.2.2	Residential/Commercial Development	Recovery Action	Prevent or minimize increased landscape disturbance.										
ESU-CCCh-22.2.2.1	Residential/Commercial Development	Action Step	Enforce existing building permit programs to minimize unpermitted construction.	3	50	City, County, County Planner						0	Action is considered In-Kind
ESU-CCCh-22.2.2.2	Residential/Commercial Development	Action Step	Modify Federal, State, city and county regulatory and planning processes to prevent or minimize new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all watersheds with essential and supporting populations.	2	15	City, County, Federal, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-22.2.2.3	Residential/Commercial Development	Action Step	Identify forestlands or oak woodland areas at high risk of conversion, and develop incentives and alternatives for landowners to discourage conversion.	3	15	City, County, County Planner						TBD	Price depends on the type of incentive provided
ESU-CCCh-22.2.2.4	Residential/Commercial Development	Action Step	Encourage infill and high density developments over dispersal of low density rural residential development.	2	50	City, County, County Planner, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-22.2.2.5	Residential/Commercial Development	Action Step	Develop legislation that will fund county planning for environmentally sound growth and water supply and work in coordination with California Dept. of Housing, Association of Bay Area Governments, and other government associations (CDFG 2004).	2	15	City, County, County Planner, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-23.1	Roads/Railroads	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ESU-CCCh-23.1.1	Roads/Railroads	Recovery Action	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-23.1.1.1	Roads/Railroads	Action Step	For all rural (unpaved) and seasonal dirt roads apply, at a minimum, the road standards outlined in the most recent version of the California Forest Practice Rules.	2	50	BOF, Local, RWQCB, Timber Landowner						TBD	
ESU-CCCh-23.1.1.2	Roads/Railroads	Action Step	Design new roadways to avoid or minimize effects to unstable slopes, wetland, floodplains and other areas of high habitat value.	2	50	BOF, Local, RWQCB, Timber Landowner						TBD	
ESU-CCCh-23.1.1.3	Roads/Railroads	Action Step	Conduct annual inspections of roads prior to winter. Correct conditions that are likely to deliver sediment to streams.	2	50	BOF, Local, RWQCB, Timber Landowner						0	Inspections should be standard practice in timber operations
ESU-CCCh-23.1.1.4	Roads/Railroads	Action Step	Restoration projects that upgrade or decommission high risk roads adjacent to streams supporting listed salmonids should be considered an extremely high priority for funding (e.g., PCSRF).	1	50	CDFW, NMFS, Timber Landowner						0	In-Kind to consider the projects, cost of upgrading/decomissioning roads is at the population level when recommended.
ESU-CCCh-23.1.1.5	Roads/Railroads	Action Step	Conduct outreach and continual education regarding the adverse effects of roads and the types of best management practices protective of salmonids. Education should address watershed process and the adverse effects of improper road construction and maintenance on salmonids and their habitats.	3	50	CalTrans, CDFW, NMFS, Timber Landowner						0	Action is considered In-Kind
ESU-CCCh-23.1.1.6	Roads/Railroads	Action Step	Evaluate and mitigate (where appropriate) the effects of transportation corridors and infrastructure on estuarine and stream fluvial processes. Mitigating measures may include, elevating existing approach, fill and maximizing clear spanning of upstream active channel(s), floodways, and floodplains to accommodate natural riverine and estuarine fluvial processes.	3	50	CDFW, NMFS, Timber Landowner						TBD	
ESU-CCCh-23.1.2	Roads/Railroads	Recovery Action	Prevent or minimize impairment to passage and migration.										
ESU-CCCh-23.1.2.1	Roads/Railroads	Action Step	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and review appropriate barrier databases when developing new or retrofitting existing road crossings.	2	50	CalTrans, CDFW, City, County, County Planner, Engineers, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-23.1.2.2	Roads/Railroads	Action Step	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents (i.e., pilings) feasible in order to minimize drift accumulation and facilitate fish passage.	2	50	CalTrans, CDFW, City, County, County Planner, Engineers, NMFS, State						0	Action is considered In-Kind
ESU-CCCh-23.1.2.3	Roads/Railroads	Action Step	For impact pile driving during construction, develop and implement sound attenuation methods that ensure sound levels are (1) below thresholds for onset of physical injury to fish (see NMFS' 2008 Interim Criteria for Injury to Fish from Pile Driving), (2) avoiding adverse behavioral effects (e.g., during adult migration, etc.), and (3) minimized by a reduction in the sound field (e.g., reduce the size of the area impacted). In situations where sound attenuation is not able to keep sound pressure at sub-injurious levels (i.e., sound levels that will not harm or injure fish), work should be conducted during seasonal work windows to avoid migrating salmonids.	2	50	CalTrans, CDFW, City, County, Engineers, NMFS, State						TBD	
ESU-CCCh-23.1.3	Roads/Railroads	Recovery Action	Prevent or minimize increased landscape disturbance.										

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-23.1.3.1	Roads/Railroads	Action Step	Encourage implementation of Vegetation Management Plans for the roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.	3	50	CalTrans, CDFW, City, County, NMFS, State						TBD	
ESU-CCCh-23.2	Roads/Railroads	Objective	Address the inadequacy of existing regulatory mechanisms.										
ESU-CCCh-23.2.1	Roads/Railroads	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-23.2.1.1	Roads/Railroads	Action Step	Support and engage CalTrans, counties and others with oversight on road practices to reduce sediment delivery to streams from road networks and channelization from poorly situated roads.	2	50	CalTrans, County, NMFS, RWQCB						0	Action is considered In-Kind
ESU-CCCh-23.2.1.2	Roads/Railroads	Action Step	Encourage enforcement of existing regulations regarding grading, riparian and building violations and sediment release from county roads.	2	50	CalTrans, County, NMFS, RWQCB						0	Action is considered In-Kind
ESU-CCCh-24.1	Severe Weather Patterns	Objective	Address other natural or manmade factors affecting the species continued existence.										
ESU-CCCh-24.1.1	Severe Weather Patterns	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-24.1.1.1	Severe Weather Patterns	Action Step	Actively conduct outreach to stakeholders and the public regarding anticipated effects of climate change to salmonids and increase awareness that human actions can offset these effects. The public, local, state and federal agencies should become familiar with, and implement as necessary through lifestyle and policy changes, recommendations of the Intergovernmental Panel on Climate Change (IPCC).	3	5	Federal, Local, NMFS, Public, State						0	See the website http://www.ipcc.ch to view a summary of climate change issues for North America and the suite of actions from the IPCC to be considered for ecosystem (and human health) due to climate change. Action is considered In-Kind
ESU-CCCh-24.1.1.2	Severe Weather Patterns	Action Step	Develop a climate strategy that addresses simultaneously the reduction of fossil fuels and the protection of forestlands.	3	15	Academic, NWFSC, State, SWFSC,						TBD	For example, promote biological carbon sequestration best management practices (BMPs), where feasible, that are consistent with NMFS policies and guidelines. Develop incentives to maintain and rehabilitate forestlands, manage for older forests, discourage conversions or forest changes. Forestlands store carbon and reduce greenhouse gases.
ESU-CCCh-24.1.1.3	Severe Weather Patterns	Action Step	Expand research and monitoring to improve predictions of climate change and its effects on salmon recovery.	2	15	Academic, NWFSC, State, SWFSC,						TBD	Tools such as the Regional Climate System Model, Sea Level Rise and Coastal Flooding Impacts Viewer, etc. should be used to improve ecological forecasting of the threat of climate change, human population growth, and their impacts to salmonids and their habitats.
ESU-CCCh-24.1.1.4	Severe Weather Patterns	Action Step	Minimize anthropogenic increases in water temperatures by maintaining well-shaded riparian areas. Work to encourage and incorporate climate change vulnerability assessments and climate change scenarios in consultations, permitting, and restoration projects.	2	50	CDFW, CORPS, County, NMFS, NOAA RC, State						0	Action is considered In-Kind
ESU-CCCh-24.1.1.5	Severe Weather Patterns	Action Step	Maintain headwater areas in an undisturbed state to ensure a continuous source of cool water downstream.	1	50	CDFW, CORPS, County, NMFS, NOAA RC, State						0	Action is considered In-Kind
ESU-CCCh-24.1.1.6	Severe Weather Patterns	Action Step	Maximize connectivity, and increase diversity, of instream habitats to allow a full range of opportunities for salmonids to exploit as environmental conditions shift.	2	100	CDFW, County, NMFS, State						TBD	

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-24.1.1.7	Severe Weather Patterns	Action Step	Evaluate feasibility and benefits of establishing an Emergency Drought Operations Center (similar to the Emergency Drought Operations Center developed in Washington State), comprised of the SWRCB, CDFW, NMFS, and others to develop emergency rules for augmenting water supplies and mitigating the effects of drought and extreme climate listed salmonids and their habitats.	2	5	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-24.1.1.8	Severe Weather Patterns	Action Step	Institute water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	1	50	CDFW, Local Government, Private Landowners, NMFS, SWRCB						TBD	
ESU-CCCh-24.1.1.9	Severe Weather Patterns	Action Step	Partner with land owners and local governments to explore the use of groundwater sources with high yield, such as Karst formations, and manage them as groundwater storage/banking, particularly during drought periods, or for adverse climate change conditions.	3	50	Local Government, Private Landowners, NMFS, SWRCB, USGS						TBD	
ESU-CCCh-24.1.2	Severe Weather Patterns	Recovery Action	Prevent or minimize impairment to estuarine quality and extent										
ESU-CCCh-24.1.2.1	Severe Weather Patterns	Action Step	Investigate the potential impact of sea level rise from climate change on the amount of salinity intrusion into fresh and brackish water habitats.	2	15	Academic, NWFSC, State, SWFSC,						TBD	
ESU-CCCh-25.1	Water Diversion/Impoundments	Objective	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ESU-CCCh-25.1.1	Water Diversion/Impoundments	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-25.1.1.1	Water Diversion/Impoundments	Action Step	Encourage cooperation among water users and coordination of their diversions where they share a common water source to minimize adverse effects of diversions on the species' habitat.	2	50	Private Landowners, NGO, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.1.1.2	Water Diversion/Impoundments	Action Step	Work with partners to promote water storage as an alternative to direct diversion during periods of low stream flow.	2	50	Private Landowners, NGO, NMFS, SWRCB						0	In-Kind. See also Hydrology
ESU-CCCh-25.1.1.3	Water Diversion/Impoundments	Action Step	Support projects that provide rainwater catchment systems to rural residential as an alternative to summer riparian diversions.	3	50	Private Landowners, NGO, NMFS						0	Action is considered In-Kind
ESU-CCCh-25.1.1.4	Water Diversion/Impoundments	Action Step	Partner with water rights holders to dedicate water already claimed under existing appropriative right to be used instead for instream benefits under California Water Code Section 1707.	2	50	CDFW, Private Landowners, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.1.1.5	Water Diversion/Impoundments	Action Step	Explore the possibility of using other easement mechanisms to dedicate water to instream uses.	2	50	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.1.1.6	Water Diversion/Impoundments	Action Step	Support temporary urgency change petitions by appropriative water right holders during critically dry periods if it will provide a benefit to salmonids.	2	50	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.1.1.7	Water Diversion/Impoundments	Action Step	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	3	50	CDFW, NMFS, Private Landowners, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.1.1.8	Water Diversion/Impoundments	Action Step	Support improvement of major dam/reservoir operations. Evaluate water release schedules and work with partners to modify as needed to improve conditions for salmonids downstream.	1	50	CDFW, NMFS, Public Works, Water Agencies, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.1.1.9	Water Diversion/Impoundments	Action Step	Support technical solutions to improved short-term precipitation forecasting where such information will facilitate more efficient management of reservoir storage.	3	50	NMFS, NOAA NWS						0	Action is considered In-Kind

California Coastal Chinook Salmon ESU Level Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Costs ($K)						Comment
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
ESU-CCCh-25.2	Water Diversion/Impoundments	Objective	Address the inadequacy of existing regulatory mechanisms										
ESU-CCCh-25.2.1	Water Diversion/Impoundments	Recovery Action	Prevent or minimize impairment to watershed hydrology										
ESU-CCCh-25.2.1.1	Water Diversion/Impoundments	Action Step	Encourage the SWRCB to exercise greater regulatory authority over summer water diversions. Water rights held under a claim of pre-1914 rights, riparian rights or older appropriative rights could be regulated to protect instream uses.	2	50	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.2	Water Diversion/Impoundments	Action Step	Work with the SWRCB and explore the feasibility of upgrading bypass flow conditions for water rights developed prior to the establishment of AB 2121.	2	10	NMFS, Private Landowners, Public Works, Water Agencies, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.3	Water Diversion/Impoundments	Action Step	Support State agencies in implementing groundwater legislation (AB 1739, SB 1168, and SB 1319) where it may result in improved surface water conditions via groundwater/surface water interaction.	1	10	County, NMFS, Private Landowners, Public Works, Water Agencies, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.4	Water Diversion/Impoundments	Action Step	Improve coordination between the agencies, particularly the SWRCB and county District Attorneys, to effectively identify and address illegal water diverters and out-of-compliance diverters, seasons of diversion, off-stream reservoirs, and bypass flows to protect listed salmonids.	1	5	County, NMFS, Private Landowners, Public Works, Water Agencies, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.5	Water Diversion/Impoundments	Action Step	Evaluate the recovery benefits of declaring some watersheds as fully appropriated and petition the SWRCB to formally declare it if appropriate.	2	10	NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.6	Water Diversion/Impoundments	Action Step	Provide technical assistance to the SWRCB in its implementation of the frost protection regulation.	2	10	Agriculture Owners, County, NMFS, Private Landowners, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.7	Water Diversion/Impoundments	Action Step	Encourage the SWRCB to conduct interagency consultation with CDFW, and seek technical assistance from NMFS on the issuance of water rights permits.	2	10	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.8	Water Diversion/Impoundments	Action Step	Counties should consider forbearance agreements that eliminate withdrawals during low-flow conditions.	2	5	CDFW, County, NMFS, Private Landowners, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.9	Hydrology	Action Step	Coordinate with CDFW and the SWRCB to ensure the effective implementation of California Fish and Game Code Sections 5935-5937 regarding the provision of fishways and fish flows associated with dams and diversions.	2	5	CDFW, NMFS, SWRCB						0	Action is considered In-Kind
ESU-CCCh-25.2.1.10	Water Diversion/Impoundments	Action Step	Encourage development of a GCP/HCP/Natural Community Conservation Plan (NCCP), conservation banks, or safe harbor agreements for new water diversions in watersheds with essential and supporting populations.	3	5	CDFW, NMFS						0	Action is considered In-Kind
ESU-CCCh-25.2.2	Water Diversion/Impoundments	Recovery Action	Prevent or minimize reduced density, abundance, and diversity based on biological viability criteria										
ESU-CCCh-25.2.2.1	Water Diversion/Impoundments	Action Step	Adequately screen water diversions to prevent juvenile salmonid mortalities.	1	50	CDFW, County, NMFS, Private Landowners						TBD	

LITERATURE CITED

55 FR 24296. 1990. Endangered and threatened species; listing and recovery priority guidelines. Federal Register 55:24296-24298.

63 FR 11482. 1998. Endangered and threatened species: proposed endangered status for two Chinook salmon ESUs and proposed threatened status for five Chinook salmon ESUs; proposed redefinition, threatened status, and revision of critical habitat for one Chinook salmon ESU; proposed designation of Chinook salmon critical habitat in California, Oregon, Washington, Idaho. Federal Register 63(45):11482-11520.

64 FR 50394. 1999. Endangered and threatened species: threatened status for two Chinook salmon evolutionarily significant units (ESUs) in California. Federal Register 64(179):50934-50415.

70 FR 37160. 2005. Endangered and threatened species: final listing determinations for 16 ESUs of West Coast Salmon, and final 4(d) protective regulations for threatened salmonid ESUs. Federal Register 70:37160-37204.

78 FR 25865. 2013. National Marine Fisheries Service. Fisheries Off West Coast States; West Coast Salmon Fisheries; 2013 Management Measures. Federal Register 78:25865-25877.

Alsea Valley Alliance v. Evans. 2001. 161 F. Supp. 2d 1154 (D. Or. 2001).

Bjorkstedt, E. P., B. C. Spence, J. C. Garza, D. G. Hankin, D. Fuller, W. E. Jones, J. J. Smith, and R. Macedo. 2005. An analysis of historical population structure for evolutionarily significant units of Chinook salmon, coho salmon, and steelhead in the north-central California coast recovery domain. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-SWFSC-382.

Busby, P., S. Grant, R. Iwamoto, R. Kope, C. Mahnken, G. Matthews, J. Myers, M. Ruckleshaus, M. Schiewe, D. Teel, T. Wainwright, F. W. Waknitz, R. Waples, J. Williams, G. Bryant, C. Wingert, S. Lindley, P. Adams, A. Wertheimer, and R. Reisenbichler. 1999. Status review update for deferred ESUs of West Coast Chinook salmon (*Oncorhynchus tshawytscha*) from Washington, Oregon, California, and Idaho. National Marine Fisheries Service.

CDFW (California Department of Fish and Wildlife). 2013. 2013 Ocean Salmon Sport Regulations. California Department of Fish and Wildlife.

Good, T. P., R. S. Waples, and P. B. Adams. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS-NWFSC-66.

Grantham, T. E., and J. H. Viers. 2014. 100 years of California's water rights system: patterns, trends and uncertainty. Environmental Research Letters 9: 084012, 10pp.

Grover, A., M. S. Mohr, and M. L. Palmer-Zwahlen. 2002. Hook-and-release mortality of Chinook salmon from drift mooching with circle hooks:management implications for California's ocean sport fishery. J. A. Lucy, and A. L. Studholme, editors. Catch and release in marine recreational fisheries, Symposium 30. American Fisheries Society, Bethesda, MD.

Moyle, P. B., J.A. Israel, and S.E. Purdy. 2008. Salmon, steelhead, and trout in California; status of an emblematic fauna. Report commissioned by California Trout. University of California Davis Center for Watershed Sciences, Davis, CA.

Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grant, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status review of Chinook salmon from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-NWFSC-35.

NMFS (National Marine Fisheries Service). 1997. Investigation of scientific information on the impacts of California sea lions and pacific harbor seals on salmonids and on the coastal ecosystems of Washington, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-NWFSC-28.

NMFS (National Marine Fisheries Service). 1998. Factors contributing to the decline of Chinook salmon: an addendum to the 1996 West Coast Steelhead Factors for Decline report. National Marine Fisheries Service, Portland, OR.

NMFS (National Marine Fisheries Service). 1999. Biological Opinion: Fishing conducted under the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. National Marine Fisheries Service.

NMFS (National Marine Fisheries Service). 2005. Memorandum to the record: Endangered Species Act section 7 consultation on the effects of ocean salmon fisheries on California Coastal Chinook salmon: performance of the Klamath Ocean Harvest Model in 2004 and implementation of the reasonable and prudent alternative of the April 28, 2000, biological opinion. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

NMFS (National Marine Fisheries Service). 2010. Interim endangered and threatened species recovery planning guidance. Version 1.3. National Marine Fisheries Service, Silver Spring, MD.

NMFS (National Marine Fisheries Service). 2012. National Marine Fisheries Service's annual approval of a 4(d) research limit (salmonids) and 4(d) research exemption (green sturgeon) to the Endangered Species Act (ESA) take prohibitions for California

Department of Fish and Game's Research Program for the next five years (2012-2016), under the authority of section 4(d) of the ESA. National Marine Fisheries Service, Southwest Region, Santa Rosa, CA.

O'Farrell, M., S. Allen-Moran, K. Atkinson, P. Dygert, S. Gallagher, A. Grover, B. Kormos, M. K. Lacy, E. Larson, M. Mohr, S. Ricker, W. Satterthwaite, and B. Spence. 2015. California Coastal Chinook Salmon Fishery Management: Future Prospects. U.S. Department of Commerce. NOAA Technical Memorandum. NOAA-TM-NMFS-SWFSC-542. May 2015. 20 pp.

O'Farrell, M. R., W. H. Satterthwaite, and B. C. Spence. 2012. California Coastal Chinook Salmon: Status, Data, and Feasibility of Alternative Fishery Management Strategies. U.S. Department of Commerce. NOAA Technical Memorandum. NOAA-TM-NMFS-SWFSC-494.

Pacific Fishery Management Council. 2007. Review of 2006 ocean salmon fisheries. Pacific Fishery Management Council, Portland, Oregon.

Quinn, T. P. 2005. The behavior and ecology of Pacific salmon and trout. American Fisheries Society, Bethesda, MD.

Reeves, G. H., J. E. Williams, K. M. Burnett, and K. Gallo. 2006. The Aquatic Conservation Strategy of the Northwest Forest Plan. Conservation Biology 20(2):319–329.

SSHAG (Salmon and Steelhead Hatchery Assessment Group). 2003. Hatchery Broodstock Summaries and Assessments for Chum, Coho, and Chinook Salmon and Steelhead stocks within Evolutionarily Significant Units listed under the Endangered Species Act. National Marine Fisheries Service, Seattle, WA.

Satterthwaite, W. H., M. S. Mohr, M. R. O'Farrell, E. C. Anderson, M. A. Banks, S. J. Bates, M. R. Bellinger, L. A. Borgerson, E. D. Crandall, J. C. Garza, B. J. Kormos, P. W. Lawson, and M. L. Palmer-Zwahlen. 2014. Use of genetic stock identification data for comparison of the ocean spatial distribution, size-at-age, and fishery exposure of an untagged stock and its indicator: California Coastal versus Klamath River Chinook salmon. Transactions of the American Fisheries Society 143:117-133.

Spence, B. C., E. P. Bjorkstedt, J. C. Garza, J. J. Smith, D. G. Hankin, D. Fuller, W. E. Jones, R. Macedo, T. H. Williams, and E. Mora. 2008. A Framework for Assessing the Viability of Threatened and Endangered Salmon and Steelhead in the North-Central California Coast Recovery Domain. U.S. Department of Commerce. NOAA Technical Memorandum. NOAA-TM-NMFS-SWFSC-423.

Weitkamp, L. A. 2010. Marine Distributions of Chinook Salmon from the West Coast of North America Determined by Coded Wire Tag Recoveries. Transactions of the American Fisheries Society 139:147-170.

Williams, T. H., S. T. Lindley, B. C. Spence, and D. A. Boughton. 2011. Status Review Update For Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Southwest. NOAA's National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, CA.